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Summary

Discussions of the economic costs and benefits of EMU usually take as their basis the optimum currency area (OCA) approach. This approach starts from the premise that when an external shock hits the economy, it is easier to adjust the exchange rate than domestic prices or wages. Most economists accept the general idea behind this approach, namely that nominal wages are usually sticky in the short-run and that it is therefore easier to adjust to external shocks and obtain changes in the real exchange rate or the terms of trade through a movement in the exchange rate. But there is little agreement on how important these "external" shocks are in reality.

We try to measure the importance of external shocks for (un)employment. We find that external shocks have little impact on unemployment, but are more important in the evolution of employment in manufacturing. The results differ, however, strongly from country to country and for about half of EU member countries we did not find any significant relationship. Taking into account various potential shock absorbers (exchange rate movements, fiscal and monetary policy) does not affect the results. We conclude that the loss of the exchange rate instrument will not lead to massive unemployment problems.

JEL classifications: E24, E52, F41

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Estimating the Costs and Benefits of EMU: The Impact of External Shocks on Labour Markets

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I. Introduction

Discussions of the economic costs and benefits of EMU usually take as their basis the optimum currency area (OCA) approach. This approach starts from the premise that when an external shock hits the economy, it is easier to adjust the exchange rate than domestic prices or wages. In the words of Mundell (1961):

"A system of flexible exchange rates is usually presented, by its proponents, as a device whereby depreciation can take the place of unemployment when the external balance is in deficit, and appreciation can replace inflation when it is in surplus (p. 657)."

Most economists accept the general idea behind this approach, namely that nominal wages are usually sticky in the short-run and that it is therefore easier to adjust to external shocks and obtain changes in the real exchange rate or the terms of trade through a movement in the exchange rate. But there is little agreement on how important these "external" shocks are in reality. Will the loss of the exchange rate instrument lead to massive unemployment because large negative external shocks are likely? Or do external shocks play only a marginal role in the evolution of unemployment? The presumption of most economists would be that external shocks should have a significant impact at least for small countries.

Thus, one key question to ask in evaluating the economic case against EMU is: Do external shocks (i.e. shocks to exports and/or the exchange rate) have a strong impact on (un)employment in member countries? This is an empirical issue that has not been addressed in the literature up to now.

The OCA approach usually asks the question: what does a country lose by giving up the exchange rate as an adjustment instrument? Implicit in this approach is the view that the alternative to participating in a monetary union is a world in which exchange rates move only in response to shocks and offset them automatically. But this might not be the alternative that is available in reality. Politicians have always asserted that exchange rates often do not move along with fundamentals and that their variability is costly. Recent research has shown that the variability that one observes in foreign exchange markets cannot be explained consistently by the behaviour of fundamentals (Baxter and Stockman 1993; Flood and Rose 1995; Rose 1995). If one accepts the finding that actual exchange rate variability is -at least to a certain extent- *excessive* one should ask whether it is just a nuisance or whether it has an impact on the real sector (Belke and Gros 1997). We will abstract from this issue here and will just try to identify the impact of external shocks on two key labour market indicators namely (economy-wide) unemployment and employment in manufacturing assuming implicitly that the alternative to fixing the exchange rate is an ideal world in which exchange rates act as shock absorbers.

As in all empirical work we had to take a number of practical decisions concerning sample periods, methods, etc. We stuck with annual data throughout the paper because we are convinced

that fundamental shocks to export demand do not occur with a quarterly frequency. We restricted our sample to the 12 EC countries (as of 1994) for which consistent data available from one source.

The paper is organised as follows: part II gives a brief overview of the empirical literature on the optimum currency area approach. Part III starts with investigating the impact of external shocks on employment and unemployment in EU member states on the basis of some simple time series 'causality tests'. Part IV extends this approach laying particular emphasis on the robustness of these results. It is tested whether the absence of a clear relationship between (un-) employment and export shocks is due to a consistent policy that on average offsets the impact of export shocks by using optimally some policy instrument, for example, the exchange rate, fiscal or monetary policy. Part V discusses some implications of the results and compares them with the result one obtains by applying the same method to investment shocks. Part VI concludes.

II. The Optimum Currency Area Approach as Presented in the Existing Empirical Literature

The standard argument in support of exchange rate flexibility is as follows: if a shock reduces the demand for the exports of a country, a real depreciation is required in order to maintain full employment and external equilibrium. The required real depreciation could also be achieved by a reduction in nominal ("money") wages, but this takes time and can presumably be achieved only if there is a period of substantial unemployment. A real-wage reduction will actually be the more difficult to achieve the more downward money wage rigidities prevail and the lower inflation already is. The proper exchange rate policy could thus reduce, and possibly even eliminate, the unemployment problems that arise from "asymmetric shocks". This line of reasoning has become the standard argument against EMU. Asymmetric shocks, it is often argued, will invariably ratchet up unemployment (Bean 1994; Gordon 1996).

There are not many available studies on the potential importance of this effect, however, which attempt to test this line of reasoning directly (Belke 1996). They usually analyse the degree to which various macroeconomic indicators, e.g. output, the real exchange rate, unemployment, etc., are correlated across countries. A finding that these correlations are low is then usually interpreted as implying that the countries concerned are subject to important asymmetric shocks and that they would incur large economic costs if they formed a monetary union.

It is difficult to decide a priori what degree of correlation is acceptable, since there is no theoretical reason to accept a correlation coefficient of say 90% for GDP growth or unemployment as sufficiently high for EMU, but reject anything below that figure. The implicit or explicit benchmark most often is the US in the sense that it is argued that if the economies of member countries of the EU show a similar degree of correlation as do states or regions inside the US, EMU should not create any particular problems for Europe.

Many previous studies have followed this approach. It is sufficient here to take just one prominent example that is representative of most of this literature. Bayoumi and Eichengreen (1994) compare the correlation of certain shocks to output among 8 regions within the US and among 11

member states within the EU.[1] They distinguish between shocks that have transitory effects, which they assume to be demand shocks, and those that have permanent effects, which they assume to be supply shocks. Their main finding is that the supply shocks, thus defined, are larger in magnitude and less correlated across regions in Europe than in the US, whereas the opposite holds for demand (i.e. transitory) shocks. Moreover, they also confirm that the core of the EU (here D, F, BE, NL and DK) constitutes a more homogeneous sub-unit. Within this restricted group of countries, supply (i.e. permanent) shocks are of roughly the same magnitude and cohesion as in the US. Their conclusion is that a core EMU is economically advisable, but not a wider EMU.

The study by Bayoumi and Eichengreen also illustrates a key problem in the empirical literature on the optimum currency area approach: the correlations in macroeconomic variables found for the past reflect not only the working of true shocks (i.e. "intrinsic" factors like taste and technology), but also, and perhaps mainly, the extent to which *monetary and fiscal policy* have in the past tended *to move together* across countries (under different exchange rate regimes).[2] The authors try to take this into account by distinguishing between supply shocks (presumably independent of policy) and demand shocks that might come from monetary and/or fiscal policy. Neither they nor any other researchers in this field, however, take into account that the OCA is based on the need to adjust the real exchange rate in response to *external* shocks. In none of the existing empirical analyses of EMU is a distinction made between external and domestic shocks. This is a crucial oversight, as argued below.

Another way to search for asymmetric shocks looks at differences in economic structures, e.g. differences in the share of output accounted for by different industries or the product composition of exports. The underlying hypothesis here is that countries that have different economic structures are likely to experience asymmetric shocks. Gros (1996a) provides a number of indicators along this line and shows that they can give quite different results. This approach can in principle provide some information on likely sources of shocks, but it cannot provide evidence on the size of the asymmetric shocks one should expect in reality. For example, a finding that two countries export different arrays of goods (as opposed to two different goods) has little implication for the likelihood of asymmetric shocks to aggregate exports: if the shocks to supply and/or demand that affect individual exporting industries or products are uncorrelated, the magnitude of the correlation coefficient between the sums of each country is not affected by the distribution of the shares in their sums.

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1 A somewhat different approach can be found in De Grauwe and Vanhaverbeke (1993) who analyse the variability of real exchange rates across regions and countries. Their finding that real exchange rates vary more significantly across countries than across regions within a country is difficult to interpret. Is it due to an excess volatility of exchange rates or are there large asymmetric shocks (policy or other) that provoke this exchange rate variability?

2 One could thus argue that the high correlations found for the core countries are probably an underestimate of the correlations that would result under EMU (i.e. with a unified monetary policy). It also cannot be excluded that some of the countries that had lower correlations in the past would actually belong to the core once they also belonged to EMU.

The available literature thus looks only at the *potential* for asymmetric shocks or measures co-movements in macroeconomic variables without showing *how* external shocks lead to unemployment. The basic question that has not yet been addressed in the literature is: are the "classic" asymmetric shocks, i.e. shocks to export demand, actually an important determinant of unemployment? A subsidiary question would concern the role of exchange rate adjustments in containing unemployment generated by shocks to export. These are key questions for any evaluation of EMU, because if the answer to both questions is yes (i.e. external shocks and the exchange rate are important for unemployment) one would have to conclude that the costs of EMU are high.

Before starting with the econometric investigation it will be useful to calculate an order of magnitude of the effects that one could expect. Exports of goods and services amount to about 30 % of GDP, on average, for the EU15.[3] This is somewhat larger than the share of investment in GDP, which on average for the EU15 was equal to about 20 % during the 1980s. Shocks to investment are usually taken to be a major determinant of the business cycle and employment. The slightly lower share of investment in GDP implies that one could expect that shocks to exports are at least equally important, however, we found the opposite: the relationship of investment with unemployment is much stronger.

The OCA approach (and this paper) focuses on the impact of external shocks on unemployment as opposed to output. The latter two variables are closely linked, however. For most countries, the standard Okun curve-type relationship translates a fall in GDP of 1% into an increase in unemployment of about 0.3 %. Given a ratio of exports to GDP of about 30 % an accounting approach would thus suggest that the partial effect of a change in exports on unemployment should be around 0.3 times the Okun coefficient. This implies that the effect of an increase in exports of 1 % should lead to an increase in the unemployment rate of around 0.09 percentage points.

The combination of the Okun coefficient and the fact that exports account for about one third of overall demand implies that *shocks to exports would have to be large* to have a *sizeable* impact on aggregate unemployment. But this cannot be excluded. For the larger EU member countries the standard deviation of the growth rate of (the volume of) exports is about 5 % p.a. It follows that a two standard deviation shock to exports should increase unemployment by about one full percentage point. This can be compared to the standard deviation of changes[4] in (national) unemployment rates which range from about 0.5 - 0.7 percentage points (p.a.) for countries like France, Germany and Italy to 1.4 percentage points for Spain if measured over the last 30 years. External shocks could thus have *potentially* a large impact relative to the historical variability of

3 About two thirds of all international trade of EU member countries is intra-EU. Given an overall ratio of trade to GDP of 30 %, this implies that intra-EU exports should amount to about 20 % of GDP for a typical member country (a bit less for the larger ones and more for the smaller ones). Data on the distribution (intra- versus extra-EU) of trade in services is, however, not published. This is the reason for the fact that the degree of economic interdependence is usually illustrated with data on the ratio of intra-EU trade in goods to EU GDP. This ratio is only about 15 %.

4 As unemployment rates are widely considered to non-stationary, see below.

unemployment. For those who believe in Keynesian multipliers the impact could be even larger than estimated so far.[5]

These simple calculations suggest *an order of magnitude* for the potential impact of export shocks on unemployment. In discussing the likely costs of EMU one must, however, also define the alternative. In an ideal world member countries could use the exchange rate to mitigate the impact of external shocks on the domestic labour market. (This does not imply that the current account and exports would have to be constant, they would just not deviate from the level that would be compatible with full equilibrium.) The key problem is that it is *impossible* to determine a priori *what fraction* of the macroeconomic cost caused by an external shock *could be avoided through an exchange rate adjustment*. If employment is the only policy target and there are no other shocks, a flexible exchange rate could eliminate 100% of the potential cost of (external) shocks. In a more general environment with more shocks, imperfect information about them an multiple policy targets as well as instruments flexible exchange rates will no longer be able to guarantee continous equilibrium on the labour market. Without specifying more of the underlying model it is not possible to say how large the cost of fixing exchange rates would be. The model simulations mentioned below suggest that about one half of the effect of an external shock could be avoided through flexible exchange rates. This would appear reasonable in an environment with two sources of shocks displaying a similar variance (exports and investment) and two policy instruments (fiscal and monetary policy).

A second point that one has to keep in mind when discussing the potential costs of EMU is that the exchange rate *vis-à-vis the rest of the world* will remain *flexible*. The ECB could take care of common shocks and member countries should be concerned only about idiosyncratic shocks. We define, as usual, idiosyncratic shocks as the difference between the national value and the corresponding EU average. On this basis the variability of export shocks is smaller. The standard deviation of the difference between national and EU average growth rates of real exports is for most member countries about 3 % (per annum). The variability of idiosyncratic shocks to exports is thus about one third smaller than the variability of total exports.[6]

The approach followed in this paper *eschews structure*. Another strategy would be to impose as much structure as possible by using a large model of the economy that allows one to calculate exactly the impact of a shock to export demand on output and other variables. One example of this approach can be found in Emerson et al. (1990) who use a large econometric model of the EC (called Quest) which incorporates the short-term wage rigidity that is at the base of the OCA. Simulations with this model suggest that a 5% shock to French export demand leads to a substantial fall in output (and prices) in France. If exchange rates are fixed, French output falls by about 1.3% in the first year and returns to baseline only by year seven. Under flexible exchange rates, however, the initial fall in output amounts still to 0.6% and the subsequent recovery is actually slower, so that the difference in present values of the GDP loss between fixed and flexible exchange rates is only 1.3%. Recent simulations with the

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5 For the detailed descriptive statistics see annex 2.

6 The standard deviation of the difference between the national and the EU average (of the first difference of) unemployment rates is also about one third lower than the national ones. For France and Germany this measure of idiosyncratic shocks to unemployment is 0.29 and 0.45 % respectively. See annex 2.

MultiMod model of the IMF confirm this result in the sense that the fall in output resulting from an exogenous fall in exports of 5% is only one-half of one percentage point of GDP higher under fixed exchange rates (private communication).

III. A Direct Test of the Optimum Currency Area (OCA) Approach

How can one measure to what extent external shocks affect (un-) employment? In principle, there are two ways: i) one could use a large macroeconomic model which traces the impact of such shocks (e.g. changes in export demand) through the entire economy under various assumptions about the flexibility of wages and the exchange rate, or ii) one could try to measure "only" the extent to which (changes in) exports have "caused" (changes in) (un-) employment in the past.

Some results using the first method are reported later in section 3. This section mainly uses the second method based on standard "causality tests". The underlying hypothesis in this case is that export supply is rather stable so that one can *equate actual changes* (innovations) in exports with *changes in export demand*. All the results presented here are implicitly based on a comparison of two regression equations:

a) $due_t = a + S_{i=1}\ a_i\ due_{t-i}$ + error term, and

b) $due_t = a + S_{i=1}\ a_i\ due_{t-i} + S_{i=0}\ ß_i\ dexp_{t-i}$ + error term,

where S stands for a summation that starts with the element indicated in the subscript, due_t stands for (the change in) unemployment (between period t and t-1) and $dexp_{t-i}$ stands for the change in exports between period t-i and period t-i-1. Exports (measured by various indicators as explained below) can then be said to "cause" unemployment if the ßs, i.e. the coefficients on past and contemporaneous exports, are together significantly different from zero. In other words, these tests measure the impact of (changes in various measures of) export performance on (changes in) national unemployment rates once the autonomous movements in unemployment have been taken into account by including lagged unemployment rates among the explanatory variables. Thus, a significant effect (of whatever sign) implies that one can reject the hypothesis that exports do not influence unemployment at the usual confidence levels. In order to be allowed to use the standard t- and F-distributions for the purpose of model selection one has to use *changes* as the levels of both variables are clearly *non-stationary* (see Annex 3). Substituting ‘de’ for ‘due’ in the above setting describes our proceedings in the case of employment instead of unemployment.

a. Unemployment

Tables 1a and 1b summarise the results of causality tests with respect to *un*employment using *annual* data (for more details see Gros and Jones 1995). The tables basically report the results from a fishing trip. The results that are not interesting in the usual sense that they yielded a good catch of "significant" relationships. On the contrary, their interest lies in revealing *an absence* of a strong and robust link between unemployment and (past changes in) exports. However, this does *not* mean that our search has been done in an *unsystematic* manner. The specifications of the underlying equations throughout this paper have been based on the usual diagnostic tests, e.g. the

LM autocorrelation test. These tests have been combined with the *Schwarz Bayesian Information Criterion (SCH)*. I.e. the regression which reveals the lowest SCH-value (given the same number of observations for the alternative specifications) and at the same time fulfills the usual diagnostic residual criteria is chosen. The SCH criterion has been preferred to the Akaike Criterion since it can be shown that the former in contrast to the latter asymptotically determines the true model (consistency) under certain assumptions (Banerjee et al. 1993: 286; Mills 1990: 139; Schwarz 1978). We always followed the same procedure throughout this paper, no judgemental factors were allowed to intervene.

Each entry in the following tables shows up in the table if the variable listed at the head of the column turned out to have a significant influence on unemployment for the particular country concerned. The four columns report the results of tests of the hypothesis that (changes in) national unemployment rates are not affected by shocks to the following variables:

i) changes (growth rates) in exports in constant 1990 ecus,

ii) changes in intra-European exports as a percentage of GDP,

iii) changes in total exports as a percentage of GDP,

iv) the contribution of exports to the growth in final uses,

v) unexpected changes in exports in constant 1990 ecus, and

vi) unexpected changes in intra-European exports as a percentage of GDP.

The *unexpected shocks* v) and vi) are used to identify shocks, as opposed to actual changes. By this, we are able to put our arguments on a somewhat broader basis. One could argue that the shocks to export demand i) to iv) are misspecified since they include export changes which in principle could be easily anticipated and neutralised by rational agents on the basis of export demand functions. Thus, we redefine the export shocks i) and ii) by subtracting that part which is determined by the change in foreign EU demand in each case. For this purpose we used a *two-step procedure*. In a first step, we estimate export demand equations (D(EXPECU) and D(EXPGDP)) for each country by regressing the change in the respective export indicator on its own lags, on the change in EU GDP and, if indicated, on structural break dummies. The equations estimated for D(EXPECU) are reported in Annex 1.[7] In a second step, we eliminate the estimated dummy impact from the residuals of the first-step regression and call the remaining series RESEXPECUF resp. RESEXPGDPF. The implicit assumption here is that the shocks proxied by the dummies cannot be anticipated. However, since the coefficients of the first-step regression and thus also the residuals are still influenced by the first-step dummies, our procedure seems to be a fair compromise.

Annex 2 gives the average and standard deviation of the variables used here. Exports are variable and difficult to predict. For example, over the period 1960–96 for Germany the standard deviation of the first (and operationally best performing) variable, the change in real ecu exports D(EXPECU) was 4.18 percentage points, (with an average of 5.78 percent). The reason for this

7 The estimated equations for D(EXPGDP) are available from the authors on request.

is that trade consists to about 60 to 70 % of intermediate or investment goods whose demand is notoriously unstable (Baxter 1995).

In order to minimise clutter, the table has *no* entry in a cell if one can*not* reject the null hypothesis of no relationship at the usual confidence levels. A negative sign implies that one can reject this null hypothesis and that, in particular, an increase in one of these proxies for export performance leads to a fall in unemployment (as one would expect). A positive sign implies the opposite and would be difficult to explain. Both coefficient estimates, including their significance levels, and the lag order of export shocks are tabulated explicitly. Tables 1a and 1b display the results.

Table 1a - *Summary results for unemployment changes as a function of export performance (OLS)*

Ind.var. country	D(EXPECU)	D(EXPGDPEU)	D(EXPGDP)	D(EXPCONTR)	RESEXPECUF	RESEXPGDPF
BE	(0) -0.040*	(0) -0.083*	(0) -0.068**	(0) -0.082**		
DK						(-1) 0.368*
ES						
FR	(0) -0.034** (-2) 0.033*	(0) -0.514*** (-1) -0.245*	(-2) 0.160*	(-1) -0.273***		(-2) 0.292*
GR						
IR		(-1) -0.125*	(-1) -0.096**			
IT	(0) 0.028*	(0) 0.393***	(0) 0.215***		(0) 0.0428*** (-2) -0.044***	(0) 0.036*** (-2) -0.029**
NL				(0) -0.081*		
PO						
UK	(0) -0.101***	(-1) 0.353**	(-1) 0.193**	(0) -0.339**	(0) -0.072*	(-1) 0.568*** (-2) 0.294*
WD	(0) -0.062*** (-1) 0.050***			(0) -0.175** (-1) 0.1872**	(0) -0.055***	(-2) -0.172**

Note: Key to independent variable list: D(EXPECU) = Change in constant ECU exports; D(EXPGDPEU) = Change in intra-European exports as percentage of GDP; D(EXPGDP) = Change in total exports as percentage of GDP; EXPCONTR = Export contribution to the growth in final uses; RESEXPECUF, RESEXPGDPEUF = as defined in the text. Data source: European Commission. The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. Additional country-specific dummies were included when necessary. Lag order of the export variable in brackets.

The five columns in Tab. 1b use two different measures of unemployment performance: i) the difference between national and EU average unemployment rates (to correct for any EU business cycle and to concentrate on nationally asymmetric shocks) in the last two columns and ii) the first three columns use the *change* in this variable because some unit root tests indicate that the differ-

ence between the national value and the EU average is not stationary.[8] We used this variable because for a country that has to weigh the costs of participating in EMU the decisive criterion is whether its own exports behave differently *from the E(M)U average*. Working in differences (national–EU value) raises again the issue of stationarity of the dependent variable. In this case the evidence against stationarity is much weaker and it is difficult to decide whether one should work in levels or first differences. We display both, but will emphazise the results in first differences because they are more comparable to the one with national values in table 1a.

The key to the independent variable list reads as follows: EXPCONTRDIFF = Export contribution to the growth in final uses, difference with European avg. (E8EXPCONTR); DEXPGDPDIFF = Change in difference with European avg. of total exports as percentage of GDP; DEXPECUDIFF = Change in difference with European avg. of constant ECU exports (EXPECUAV)[9]; EXPGDPDIFF = Total exports as percentage of GDP, difference with European avg. (E5EXPGDP). EU average unemployment rate = EU15UE (for more detailed information see the annex).

8 The measures for export performance used with these dependent variables was then also somewhat different as explained in the key to Table 1b.

9 This variable is introduced to take account of different degrees of openness of countries in the sample.

Table 1b - *Summary results for unemployment differences (with European average) as a function of export performance (OLS)*

Dep. var.	Changes in unemployment differences			Unemployment differences	
Ind. var.	EXPCONTRDIFF	DEXPGDPDIFF	DEXPECUDIFF	EXPCONTRDIFF	EXPGDPDIFF
BE	(-1) -0.049*	(-2) -0.053*		(-1) -0.073**	(-1) -0.016*
DK					(-2) -0.153***
ES				(0) 0.325*	(-1) -0.163**
FR					
GR					(-2) 0.233***
IR		(-1) -0.090*			
IT		(-1) 0.360***	(-1) 0.045*	(-1) 0.240**	(0) 0.178*** (-2) -0.291***
NL					(-2) -0.116***
PO	(-2) -0.123***	(-2) -0.114*	(-2) -0.024**	(-1) -0.090* (-2) -0.114**	(-1) -0.064*
UK	(-2) -0.294*	(-2) -0.231**	(-2) -0.082**	(-2) -0.330**	
WD		(-1) 0.220***		(0) -0.175*	(-1) 0.206** (-2) -0.242***

Note: Data source: European Commission. The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. Additional country-specific dummies were included when necessary. Lag order of the export variable in brackets.

Even a cursory glance at the columns of Table 1b shows, however, that, at least in the first three columns with first differences, there are even fewer significant entries (and a number of wrong signs) so that changing the dependent variable does not affect the conclusion that the impact of exports on unemployment is weak.[10]

In Table 1a all variables have the same number of entries (5). But even if one concentrates on the variables that perform "best", it still remains true that for almost one-half of all member countries, shocks to exports have in the past played no significant role in determining unemployment in the way one would expect from the OCA approach. This was found for a medium sized and relatively closed country like Spain as well as for a small country like Denmark, for poor countries like Greece and Portugal and for a rich country like, again, Denmark or the Netherlands.

For the other member countries, shocks to exports had some influence on the evolution of unemployment. A closer look at the individual regressions, however (not reported in the table for lack

10 In some cases in Tab. 1a and 1b, an increase in exports first reduces (increases) unemployment and then increases (decreases) it, with the net effect nearly equal to zero. However, these cases of a significant wrong sign should be discounted along with some of the weaker coefficients of the right sign. Given the number of regressions that are behind the tables (11 countries using 9 proxies for export demand), it is surprising that there are not more cases of spurious correlation.

of space), shows that this influence was in all cases *minor*, in the sense that shocks to exports could explain only a *small part* of the fluctuations of unemployment rates over time.

With respect to e.g. the first column in Table 1a, the strongest influence of exports on unemployment can be found in the case of the U.K. This impact is obviously stronger than with respect to potential EMU candidate countries. Even in the case of the U.K., however, the influence of exports turns out to be *marginal* as will be apparent from the regression results that are presented as an example below (significance levels in parenthesis).

The first regression on annual data for the U.K. (1960-96) gave the following result:

$due_t = 0.07 + 0.65*due_{t-1} - 0.38*due_{t-2}$

(0.55) (0.00) (0.01)

Standard error of regression 0.664

The second regression gave the following result:

$due_t = 0.57 + 0.56*due_{t-1} - 0.31*due_{t-2} - 0.10*dexp_t$

(0.00) (0.00) (0.01) (0.00)

Standard error of regression 0.527

One way to measure the influence of exports is to look at the part of the variability of unemployment that can be explained by export shocks. These results show that the standard deviation of the unemployment rate (after accounting for its own past) is 0.664 percentage points. Introducing the best performing measure of exports performance (the change in real exports), it drops to 0.527 percentage points, or by about 21%. This means that for the U.K., export shocks had a non-negligible but still *rather small* effect on unemployment. The coefficient on the contemporaneous change in exports implies that a one percentage increase in the growth rate of exports (say from 9 to 10%) is associated with a drop in the U.K. unemployment rate of 0.1 percentage points (e.g. from 10 to 9.9%). The standard deviation of DEXPECU for the UK was 3.35 percentage points (see Annex 2). A positive one standard deviation shock would thus lead to a fall in the unemployment rate by 0.335 percentage points. However, this is a *contemporaneous* correlation. It is thus difficult to say whether it indicates a causal relationship (with the effects being felt within one year) or whether it is just a spurious correlation due to the fact that business cycles are highly correlated in the EU. We tend towards the second interpretation because during most of the estimation period the UK labour market was not flexible it takes a long time for firms in continental Europe to reduce their workforce. The results displayed in table 1b tend to confirm that there is a strong European business cycle behind the results in table 1a. In first differences only one country shows an impact for variable EXPCONTRDIFF and the number increases only to 3 for the variable DEXPGDPDIFF. In levels there are, however, substantially more significant entries.

The impact of U.K. exports is one of the strongest effects found in the entire sample. For the other countries, the contribution of export shocks to unemployment was *even smaller*. In the case of Italy, but sometimes also for other countries, the weak correlation that actually appears in some

cases has the wrong sign; i.e. increases in export demand are associated with increases in unemployment. This is probably just a spurious correlation.

Tables 1a and 1b also suggest that for some of the core countries (D, BE, FR), trade has a significant influence on unemployment, at least if one looks mainly at the first four columns. At first sight, this might contradict the perceived wisdom that these countries are best suited for EMU. A look at the individual regression results reveals, however, that the majority of cases in Tab. 1a give similar results as the ones for the U.K. shown above in the sense that only the coefficient on the contemporaneous change in exports ($ß_0$) was significant, whereas changes in exports one year earlier did not have an impact on unemployment. This contemporaneous correlation probably simply reflects the greater correlation in business cycles within this group of countries. The quarterly data used by Gros (1996) confirms this interpretation. A further confirmation comes from the fact that almost all of the significant *contemporaneous* coefficients reported in Table 1a disappear in Table 1b which takes out the European business cycle by using the differences with the EU average.

Using the residuals from the export demand equations as export demand shocks (RESEXPECUF and RESEXPGDPF) does not affect the main conclusions, i.e. that the impact of export shocks on unemployment is weak and in more than half of the cases even insignificant.

b. Employment in Manufacturing

To test for robustness of the above results we apply the same methodology described above to manufacturing *employment* in several EU-countries. Thus, we circumvent the well-known weaknesses of the unemployment rate to reflect excess supply on labour markets correctly. Moreover, we take account of the hypothesis claimed by Decressin and Fatàs (1995) that in the EU (in contrast to the U.S.) asymmetric external shocks that affect the demand for labor lead to changes in labour force participation rather than to migration of labour at least at the regional level. If employment is to a greater extent influenced by shocks to export demand than unemployment, this should be an important empirical hint at the validity of this hypothesis. Manufacturing was used because it provides most of *traded* goods and should react more strongly to external shocks. In order to be allowed to use the standard t- and F-distributions we again have to use *changes* of manufacturing employment EMPLMAN as the levels are clearly *non-stationary* (see Annex 3). The respective results are shown in Tables 2a and 2b.

Table 2a - *Summary results for manufacturing employment growth as a function of export performance (OLS)*

Ind. Var.	D(EXPECU)	D(EXPGDPEU)	D(EXPGDP)	D(EXPCONTR)	RESEXPECUF	RESEXPGDPF
BE	(0) 0.174**	(0) 0.330** (-1) 0.244**	(0) 0.206** (-1) 0.257**	(0) 0.297**		(-1) 0.300**
DK		(-1) -0.886**	(0) -0.855***		(0) -0.357**	(-1) -0.849**
ES					(-1) -0.391**	
FR		(0) 1.544***		(0) 0.656**	(-1) 0.197**	(-1) 1.127**
GR	not available					
IR			(-1) 0.260**	(-2) 0.321**		(-2) 0.437**
IT	(-1) 0.185***	(-1) 2.000***	(-1) 0.588*	(-1) 1.20***	(-1) 0.175**	(-1) 1.948***
NL	(-1) 0.251***	(-2) -0.266*	(-2) -0.210*	(0) 0.349** (-1) 0.452***		(-2) -0.238*
PO	(0) 0.097**	(0) 0.665***	(0) 0.467***	(0) 0.293**		(-1) 0.957***
UK	(0) 0.719***		(0) 0.648*	(0) 1.591*** (-1) 1.043*	(0) 0.4247*	
WD	(0) 0.244***	(0) 0.605** (-2) 0.684**	(0) 0.376* (-2) 0.383		(0) 0.240***	(0) 0.662* (-2) 0.656**

Note: For notes see Tab. 1a.

Table 2b - *Summary results for differences (with European average) of manufacturing employment (growth and levels) as a function of export performance (OLS)*

Depend. var.	Changes in employment differences			Employment differences	
Indep.var.	EXPCONTRDIFF	DEXPGDPDIFF	DEXPECUDIFF	EXPCONTRDIFF	EXPGDPDIFF
BE	(-2) 0.326***	(-1) 0.170**	(-2) 0.204**	(0) 0.323***	(0) 0.382*** (-1) -0.149*
DK	(0) -1.196*** (-2) -1.316***	(0) -0.478*	(0) -0.330**	(-1) 0.910**	(0) -0.489** (-1) 1.3025***
ES	(0) -1.097**	(0) -2.102*** (-2) -2.095***	(0) -0.326**		(-1) -1.313** (-2) 1.814**
FR	(0) 0.757**	(-1) -0.458*		(0) 0.710** (-1) 0.955***	
GR			not available		
IR	(-2) 0.571***	(-1) 0.213** (-2) 0.194*	(-2) 0.190**	(-2) 0.904***	(0) -0.266** (-1) 0.542***
IT	(-1) 0.652***	(0) -0.377* (-1) 0.391*	(-1) 0.141**	(-1) 0.414**	(-1) 0.285***
NL	(0) -0.358***	(-2) 0.254***		(0) -0.348*** (-2) 0.422***	
PO	(-2) -0.495**	(-2) -0.571***		(-2) 0.345**	(-2) -0.177*
UK		(0) 0.838**			(0) 0.448*
WD	(0) 0.553** (-2) -0.542**	(-1) 0.555**	(0) 0.205**	(0) 0.794***	(-2) 0.551***

Note: For notes see Tab. 1b. Because of limited data availability the sample range does not always cover the whole time span of 1960-1996.

Tables 2a and 2b clearly reveal *more significant* entries than Tables 1a and 1b. Unfortunately, however, in Table 2b 20 of the significant entries have the wrong (negative) sign against 32 with the correct sign.

The coefficients reported in Tables 2a and 2b are generally *larger* in absolute values than those of Tables 1a and 1b, as one would expect given that manufacturing produces mostly tradable goods. However, if one takes into account that manufacturing represents only about 20 % of overall employment the coefficients in Tables 1 and 2 become comparable under the hypothesis that external shocks impact mainly on manufacturing employment and that labour supply is constant in the short run. The latter translates (5:1) into economy-wide unemployment rates assuming that employment in the rest of the economy is not affected and the supply of labour is constant.[11]

[11] How can one compare the coefficients on unemployment (a rate) with the ones on employment growth? Assume that total employment, N, is given by the sum of employment in the manufacturing sector, N_m, and employment in the services sector, N_s. The unemployment rate UE is then given by:
$UE = \left[L - \left(N_s + N_m\right)\right] / L$.

With respect to e.g. the first column in Table 1b, the strongest influence of exports on manufacturing employment can again be found in the case of the U.K. While the influence of exports turns out to be *marginal* in many countries it is more important for the U.K. as will be apparent from the regression results that are presented as an example below (significance levels in parenthesis).

The first regression on annual data for the U.K. (1960-96) gave the following result:

$de_t = -1.92 + 0.41*de_{t-1} - 0.19*de_{t-2}$

(0.03) (0.03) (0.29),

with a standard error of regression of 2.71.

The second regression gave the following result:

$de_t = -4.73 + 0.42*de_{t-1} - 0.14*de_{t-2} + 0.72*dexp_t$

(0.00) (0.00) (0.15) (0.00),

with a standard error of regression 1.54.

One way to measure the influence of exports is to look at the part of the variability of manufacturing employment that can be explained by export shocks. These results show that the standard deviation of the index of manufacturing employment (after accounting for its own past) is 2.708 percentage points. Introducing the best performing measure of exports performance (the change in real exports), it drops to 1.538 percentage points, or by about 43%. This means that for the U.K., export shocks had a substantial effect on manufacturing employment, i.e. employment in the tradeable sector. However, in many other countries the part of the variability of manufacturing employment that can be explained by external shocks looks much smaller.

The coefficient on the contemporaneous change in exports implies that a one percentage increase in the growth rate of exports (say from 9 to 10%) is associated with an increase in U.K. manufacturing employment of 0.72 percentage points (e.g. the index would go from 100 to 100.72 percentage points). For many of the remaining countries, however, this impact appears to be smaller.

IV. Robustness

a. The Influence of the Exchange Rate

The *weak* relationship between export earnings and unemployment could be explained in a number of ways. A first objection would be that actual export shocks are determined by *shocks to supply* as well as demand. Nevertheless, it is difficult to see why export supply should be subject to large shocks that act within one year or one quarter. The capital stock and even labour inputs move

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If the labour force, L, is constant and external shocks only affect employment in manufacturing the change in unemployment rate, DUE, is then given by the proportional change in manufacturing employment, DN_s times the share of manufacturing employment in the labour force: $DUE = -(DN_m)(N_m / L)$.

Given that the share of employment in manufacturing in total employment is slightly above 20% a value of 0.2 for N_m/L seems appropriate. The difference between $N_m/(N_m+N_s)$ and (N_m/L) is small at normal unemployment rates. This would imply that the coefficient on manufacturing employment should be about 5 times as large as that on unemployment.

only slowly and technology does not make jumps. By contrast, it is much easier to imagine reasons why export demand should be unstable: the business cycle abroad can move rapidly or the demand for specific types of investment goods can change suddenly.

Another argument could be that the absence of a clear relationship between unemployment and export shocks is *due to a consistent policy* that on average *offsets* the impact of export shocks by using optimally some policy instrument, for example, the exchange rate (or fiscal resp. monetary policy, see the estimations below).

In principle, this last point could be taken into account, although the degree to which the exchange rate was used as an adjustment instrument varied enormously over the last 30 years. The degree of wage flexibility might also have varied considerably, but it is difficult to find any succinct measure of this latter variable. This aspect was therefore not used in the empirical analysis. The crude tests on the annual data reported below, however, suggest that this factor cannot have been responsible for the results so far.

Exchange rate adjustments should thus be incorporated in the analysis. Otherwise, one could argue that the absence of an effect of export shocks on unemployment is due to the fact that during part of the period used in this investigation (1960-96) exchange rates were flexible. One way to test this conjecture is to add (changes in) the real exchange rate among the determinants of unemployment. This conjecture could not be rejected, if both exports and real effective exchange rates become highly significant once implemented simultaneously. Table 3a reports the results with annual data obtained using a similar approach as the one used to measure the importance of shocks to exports: the change of the real exchange rate is included among the variables explaining changes in unemployment. In Table 3a, the expected sign of exports is negative and that one of the real effective exchange rate is positive. The specification of the underlying equations has again been based on the usual diagnostic tests combined with the Schwarz-criterion. I.e. the regression which reveals the lowest SCH-value (given the same number of observations) and at the same time fulfills the usual diagnostic criteria is chosen as a reference. Whether we used levels or first differences of the respective time series was dependent on the results of the respective stationarity tests (McKinnon 1991, Phillips and Perron 1988).[12] We applied this procedure also to Tables 3c to 3f.

[12] The test results are available from the authors if they are not listed in annex 3.

Table 3a - *Change in unemployment as a function of its own history, the change in real exports and the change in real effective exchange rates (OLS)*

Country	Change in unemployment (lags)	Change in real exports (ECU 1990) (lags)	Change in real effective exchange rates (lags)
BE	(-1)***	(0) -0.04* (↑)	(0) 0.01
DK	(-1)***	(-1) -0.06 (↑)	(0) -0.05** (-2) 0.06**
ES	(-1)*** (-2)***	(0) -0.04 (↑)	(-1) -0.04
FR	(-1)	(0) -0.03* (↓)	(-1) -0.01
GR	(-1)*** (-2)**	(-1) -0.00 (↓)	(-1) 0.02*
IR	(-1)***	(-1) -0.02 (↑)	(0) -0.01
IT		(-1) -0.02 (↓)	(0) -0.06***
NL	(-1)**	(0) -0.02 (↑)	(-1) 0.04**
PO	(-1)***	(0) 0.01 (↓)	(-2) 0.02**
UK	(-1)*** (-2)***	(0) -0.09** (↓)	(0) 0.01
WD	(-1)*** (-2)***	(0) -0.06*** (-1) 0.05*** (→)	(0) 0.02

Note: The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. ↑ (↓) means that the coefficient becomes more (less) significant than in the respective equation without the real effective exchange rate. Additional country-specific dummies were included when necessary.

One finds that changes in the (real) exchange rate also do not significantly affect unemployment. The real exchange rate has a significant and unambigious positive impact on unemployment (once one takes into account past unemployment) only for Greece (*), the Netherlands (**) and Portugal (**). In *no* case case *both* the (change in) real exports and the real exchange rates are significant. Nor has the significance of (the change in) exports increased under these limitations.

These results were obtained by just adding *actual* changes in the real exchange rate as one of the determinants of unemployment. The use of actual exchange rate changes implies that one does *not* measure only the relevance of the exchange rate as a policy *instrument*. Under floating rates, exchange rates are determined by many factors and do not always move in the direction wanted by policy-makers. The fluctuations of the Italian lire starting in 1992 is only the most recent example. The results reported in Table 3a thus indicate that either exchange rates are not a major policy instrument or that, if they move for other reasons, they did not have a major impact on unemployment (Belke 1996). The argument that the exchange rate instrument was used up to now to offset shocks to export demand that would otherwise have resulted in unemployment is thus *not supported* by the empirical evidence.

The above results -in the same way as Tables 1a and 1b- again reveal a *rather small* influence of exchange rates on unemployment. This is understandable if one takes into account that the ratio of exports to GDP in the larger countries is around 25 to 30% and that the price elasticity of exports is about one-half. These two numbers imply that a 10% depreciation (in real terms) increases GDP by between 1.25 to 1.5%. Furthermore, one has to take into account "Okun's law" which calls for around 3% growth in real income in order to reduce unemployment by one percentage point. The reduction in unemployment that could be achieved by a 10% devaluation is

only 0.4 to 0.5 percentage points. Unless exchange rate movements are very large, they are unlikely to have a strong impact on unemployment.

In Table 3b, whose underlying regressions simply substitute employment for unemployment, the expected sign of exports is positive and that one of the real effective exchange rate is negative. The corresponding results are tabulated below.

Table 3b - *Change in employment in manufacturing as a function of its own history, the change in real exports and the change in real effective exchange rates (OLS)*

Country	Change in employment (lags)	Change in real exports (ECU 1990) (lags)	Change in real effective exchange rates (lags)
BE	(-1)***	(0) 0.20** (↑)	(-1) -0.11*
DK	(-1)	(-2) -0.23* (↑)	(0) 0.23**
ES	(-1)	(-1) -0.17 (↓)	(0) 0.48***
FR	(-1)***	(0) 0.11 (↓)	(0) 0.03
GR			
IR	(-1)***	(-2) 0.12* (↑)	(-1) -0.22**
IT	(-1)***	(-1) 0.16** (↓)	(-1) -0.09
NL	(-1)***	(-1) 0.28*** (↑)	(-2) -0.05
PO	(-1)***	(-1) 0.05 (↓)	(-1) -0.13**
UK	(-1)*** (-2)	(0) 0.69*** (→)	(-1) -0.04
WD	(-1)*** (-2)***	(0) 0.25*** (→)	(0) 0.07

Note: The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. ↑ (↓) means that the coefficient becomes more (less) significant than in the respective equation without the real effective exchange rate. Additional country-specific dummies were included when necessary.

On the basis of Table 3b nearly the same story as with respect to Tab. 3a emerges. The estimated impacts of exports on employment as shown in Tab. 2a are not dramatically altered by the inclusion of the real effective exchange rate. The magnitude of coefficient estimates appears to be unaffected. In only two cases (Denmark and Ireland) the inclusion of the real effective exchange rate leads to an increase in number of *'s, i.e. a stepwise increase in the significance level. However, in two other cases (Italy and Portugal) the number of *'s, i.e. the significance levels, even shrinks. Moreover, the estimations for Denmark result in wrong signs for exports and for the real effective exchange rate. Again, the argument that the exchange rate instrument was used to neutralize shocks to export demand that would otherwise have resulted in lower employment (or moved as a 'shock absorber' in reaction to distortions on labor markets) is *not corroborated* by the empirical evidence.

Another argument for the absence of a clear relationship between (un-) employment and export shocks might be a consistent *fiscal or monetary policy* that on average reacts to and manages to offset the impact of export shocks. This hypothesis is tested empirically in the following chapters b and c. Since this is done along the lines already used above in this chapter, comments are held rather scarce. We proceed with tests of the shock absorbing impact of fiscal policy.

b. The Influence of Fiscal Policy

According to our hypothesis, the expected sign of exports in the unemployment regressions is negative and that of government deficit (deficits have a negative, surpluses a positive sign) is positive. The corresponding results are shown in Table 3c.

Table 3c - *Change in unemployment as a function of its own history, the change in real exports and the change in fiscal policy (OLS)*

Country	Change in unemployment (lags)	Change in real exports (ECU 1990) (lags)	Change in government deficit (lags)
BE	(-1)***	(0) -0.05** (↑)	(0) -0.14** (-1) -0.09**
DK	(-1)*	(-1)-0.05 (↑)	(0) -0.20*** (-1) -0.09*
ES	(-1)*** (-2)***	(-1) -0.03 (↓)	(0) -0.42*** (-2) -0.89***
FR	(-1)***	(0) -0.01 (↓)	(0) -0.28***
GR			
IR	(-1)***	(-1) -0.02 (↑)	(-1) -0.14**
IT	(-1)*	(-2) -0.03** (↑)	(0) -0.08
NL	(-1)***	(-1) 0.02 (↑)	(0) -0.19**
PO	(-1)***	(-1) -0.01 (↓)	(0) 0.02
UK	(-1)*** (-2)***	(0) -0.10*** (→)	(-2) -0.09
WD	(-1)*** (-2)***	(0) -0.06*** (-1) 0.05*** (→)	(-2) -0.05

Note: The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. ↑ (↓) means that the coefficient becomes more (less) significant than in the respective equation without the proxy for fiscal policy. Additional country-specific dummies were included when necessary.

With respect to *employment* regressions, the expected sign of exports is positive and that of government deficit (deficits have a negative sign) is negative (Table 3d).

Table 3d - *Change in employment in manufacturing as a function of its own history, the change in real exports and the change in fiscal policy (OLS)*

Country	Change in employment (lags)	Change in real exports (ECU 1990) (lags)	Change in government deficit (lags)
BE	(-1)***	(0) 0.15** (↑)	(0) 0.82***
DK	(-1)	(-2) -0.19* (↑)	(0) 0.79***
ES	(-1)**	(0) -0.11 (↓)	(0) 0.85**
FR	(-1)***	(-1) 0.11 (↑)	(0) 0.80***
GR			
IR	(-1) 0.48***	(-2) 0.09 (↓)	(-1) 0.32
IT	(-1)***	(-1) 0.16*** (→)	(0) 0.84***
NL	(-1)***	(-1) 0.27*** (→)	(-2) 0.27
PO	(-1)***	(0) 0.10** (→)	(-1) 0.15
UK	(-1)*** (-2)	(0) 0.68*** (→)	(0) 0.28
WD	(-1)*** (-2)***	(0) 0.25*** (→)	(-1) 0.17

Note: The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. ↑ (↓) means that the coefficient becomes more (less) significant than in the respective equation without the proxy for fiscal policy. Additional country-specific dummies were included when necessary.

With respect to Table 3c, only in the cases of Belgium and Italy exports gain some significance. However, for Belgium the coefficient of fiscal policy does not reveal the expected sign and in the case of Italy it is even not significant. According to Table 3d, only for Denmark the significance of exports increases, but with the wrong sign.

Throughout the Tables 3c and 3d, the coefficient of GOVDEF (+ means net lending, - net borrowing) does *not* reveal the sign expected by those preferring a *counter-cyclical* interpretation. In contrast to the latter, these results possibly indicate that government deficits have increased for *other reasons* than export demand shocks. Another interpretation might be that there have not been many significant (asymmetric) export shocks to which government deficits could have rejected in a systematic manner. To summarise, the hypothesis that fiscal policy was used up to now to offset shocks to export demand that would otherwise have resulted in unemployment or losses in employment is *not accepted* by the data. Let us now turn to the tests of the relevance of the last potential 'shock absorber', *monetary policy*. For this purpose, we use the same procedure as with respect to exchange rates and fiscal policy.

c. The Influence of Monetary Policy

The corresponding results for *unemployment* are displayed in Table 3e, those for *employment* in Table 3f. In Table 3e (3f), the expected sign of exports and that of the indicator of the monetary policy stance, the (stationary level of the) interest rate spread, are both negative (positive).

Table 3e - *Change in unemployment as a function of its own history, the change in real exports and the change in monetary policy (OLS)*

Country	Change in unemployment (lags)	Change in real exports (ECU 1990) (lags)	Spread (Lags)
BE	(-1)***	(0) -0.03 (↓)	(-1) -0.05
DK	(-1)	(-1) -0.04 (↑)	(0) -0.04
ES	(-1)*** (-2)**	(-2) 0.14 (↑)	(-1) -0.71***
FR	(-1)	(0) -0.04** (↑)	(-1) -0.10*
GR			
IR	(-1)***	(0) -0.03 (↑)	(-2) -0.31***
IT	(-1)* (-2)**	(0) 0.04*** (↑)	(-1) -0.09***
NL	(-1)***	(0) -0.09*** (↑)	(0) 0.24*** (-1) -0.16*
PO	(-1)***	(0) -0.05 (↓)	(0) -0.13**
UK	(-1)*** (-2)**	(0) -0.10*** (→)	(-1) -0.04
WD	(-1)***	(0) -0.05*** (→) (-1) 0.02*	(-1) -0.19***

Note: The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. ↑ (↓) means that the coefficient becomes more (less) significant than in the respective equation without the proxy for monetary policy. Additional country-specific dummies were included when necessary. These notes also refer to Tab. 3e.

The coefficient estimates of exports roughly stay the same as without implementing a monetary policy variable. Moreover, only for Italy and the Netherlands the numbers of *'s could be enhanced, i.e. the inclusion of monetary policy leads to a better fit of exports in the unemployment regression.

Table 3f - *Change in employment in manufacturing as a function of its own history, the change in real exports and the change in monetary policy (OLS)*

Country	Change in employment (lags)	Change in real exports (ECU 1990) (lags)	Spread (lags)
BE	(-1)***	(-1) 0.15* (↓)	(-1) 0.75***
DK	(-1)*	(-2) -0.16 (↓)	(0) 0.39*
ES	(-1)***	(-1) -0.37* (↑)	(0) 0.34
FR	(-1)***	(0) 0.14* (↑)	(-1) 0.33*
GR			
IR	(-1)***	(-2) 0.32*** (↑)	(0) 0.37
IT	(-1)***	(-1) 0.25*** (→) (-2) 0.15**	(0) -0.44***
NL	(-1)***	(0) 0.13* (↓)	(-2) 0.56***
PO	(-1)	(0) 0.23** (↑)	(-2) 0.88***
UK	(-1)***	(0) 0.74*** (→)	(-1) 0.35***
WD	(-1)*** (-2)***	(0) 0.21*** (→)	(-1) 0.48**

Also with respect to employment, thus, the coefficient estimates of exports roughly stay the same as without implementing a monetary policy variable. Moreover, only for Spain, France and Ireland the numbers of *'s could be enhanced, i.e. the inclusion of monetary policy leads to a better fit of exports in the unemployment regression. However, the significance level clearly decreases for Belgium, Denmark and the Netherlands. According to both Tables 3e and 3f, the results for the spread came out in most cases to be as theoretically expected. By this feature, a well-known prior -the significance of the interest rate spread in forecasting equations for real activity- is empirically corroborated by our estimates.

The argument that monetary policy reacted in the past to offset shocks to export demand that would otherwise have resulted in unemployment or in losses in manufacturing employment is thus *not convincingly supported* by the empirical evidence. That is to say, there might on the one hand have been export shocks to which monetary policy reacted from time to time. On the other hand, these export shocks neither occur frequently enough nor do they have a throughout significant impact on (un-) employment.

All equations in Tables 3a to 3f have complementarily been estimated including the *lowe*st number of dummies necessary to fulfill the usual residual diagnostics. While ignoring the SCH-criterion in this case, which in our case recommendates the implementation of more highly significant dummies, the results nearly stay the same and are available from the authors on request.

d. The Simultaneous Impact of Potential Shock Absorbers

The tests for robustness of the (non-) relation between (un-)employment and export demand shocks in chapter IV might be criticised for several reasons. For example, the data set and, therefore, the results might be infected by *multicollinearity* problems. The respective two explaining variables -changes in exports and real exchange rates/government deficits/interest rate spread- might have a simultaneous impact on each other from a theoretical point of view. On the one hand, the exchange rate can move in reaction to export shocks. On the other hand, exchange rate changes might influence the export demand. Though cross-correlations with few exceptions (U.K.

and Portugal) indicate that there is nearly no significant relation between these variables, we prefer to be careful: in case of multicollinearity, the insignificance of cross-correlations does not necessarily indicate the absence of multicollinearity. By finding instruments for the respective variables in the following we try to lessen the problem of multicollinearity somewhat, if it should be there. However, several arguments speak in favour of our procedure in chapter IV, even if there (as always) is some degree of multicollinearity. First, coefficient estimates stay best linear unbiased estimators. Second, since we regress changes on changes, common trends in the variables mainly responsible for multicollinearity are to a large extent eliminated. Third, groups of regressors -as is the aim of our study- continue to have their standard distributions. Thus, their significance can be read off the regression output as before (Gujarati 1992, pp. 289 ff.).

A second objection weighs more heavily at first glance, if one abstracts from cases of high lags of the explaining variables in Tables 3a to 3f. Since (un-) employment is regressed on export demand, exchange rates, fiscal policy and monetary policy, potential *simultaneity problems* arise. E.g., on the one hand, a change in exchange rates (indirectly) or in exports (directly) could influence (un-) employment. On the other hand, some theoretical models predict an exchange rate adjustment in cases of (un-) employment changes and -via the exchange rate channel- a change in exports. If one for a moment neglects the failure of empirical studies in finding dominant short- or mid-term real influences for exchange rate movements (Canzoneri, Vallés, Viñals 1996, Rose 1995), some of the right-hand variables in Tables 3a to 3f are endogenous and *correlated with the error*. This means that OLS would lead to *biased* estimates. To test for the relevance of these objections we run Two-Stage Least Squares (TSLS) on *German data* using the same set of variables as in Tables 3a and 3f. The procedure we implement could not be replicated for all the countries for reasons of space. Germany was chosen because it is a key country.

We try to define variables (instruments) which are uncorrelated with the residual and at the same time serve to find the component of the potentially endogenous variables exchange rate, fiscal policy and monetary policy that is attributable to the instrument. As instruments besides the predetermined exogenous variables we choose an EMS-Dummy EMS, the change in the U.S. nominal short-term interest rate D(USINTS), the change in intra-EU imports of goods at current prices D(IMPEU) and the change in the general government structural balance D(WDGOVDEFC). As shown in the following tables, the instruments in each case satisfy the order and the rank condition for identification and include lagged endogenous (and exogenous) variables to get consistent estimates. With respect to unemployment *and* manufacturing employment we proceed as follows. As a first step, we run TSLS-regressions as in Tables 3a to 3f separately for each pair of an export shock and a potential shock absorber (exchange rate or fiscal policy or monetary policy). As a second step, we use TSLS incorporating all three potential shock absorbers simultaneously.

The corresponding estimation results *for unemployment* are shown in Tables 4a to 4d, those *for employment* in Tables 5a to 5d. The results reveal the minor importance of export demand shocks (insignificance and or a small significant coefficient). Only in two cases (5c and 5d) are the coefficient of exports and that of a shock absorber (here: SPREADWD) simultaneously significant, both revealing the correct sign. As above, the only more or less significant shock absorber is the

SPREAD, i.e. monetary policy. This corresponds to our prior. The TSLS estimations, therefore, suggest that the examined pootential shock absorbers (with the exception perhaps of monetary policy and employment) cannot have been responsible for the results so far. However, as in the preceding examinations in chapter III, export demand shocks seem to be more significant with respect to employment in manufacturing than for unemployment. On the whole, our results gained in chapters IVa to IVc are impressively corroborated.

Tab. 4a - *Change in German unemployment as a function of its own history, the change in real exports, and the change in real effective exchange rates (TSLS)*

TSLS // Dependent Variable is DWDUE
Sample(adjusted): 1963 1994
Included observations: 32 after adjusting endpoints
Instrument list: C DWDUE(-1) DWDUE(-2) DWDEXPECU(-1) DDEREER(-1) EMS D(IMPEU) D(USINTS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.031131	0.251154	-0.123953	0.9023
DWDUE(-1)	0.841791	0.260643	3.229671	0.0035
DWDUE(-2)	-0.362019	0.185521	-1.951365	0.0623
DWDEXPECU	-0.028410	0.026677	-1.064985	0.2971
DWDEXPECU(-1)	0.050336	0.023833	2.112052	**0.0448**
DDEREER	-0.016294	0.085983	-0.189501	0.8512
DDEREER(-1)	0.020765	0.024382	0.851670	**0.4025**

R-squared	0.582742	Mean dependent var	0.194184
Adjusted R-squared	0.482601	S.D. dependent var	0.681623
S.E. of regression	0.490295	Akaike info criterion	-1.234857
Sum squared resid	6.009724	Schwarz criterion	-0.914227
F-statistic	5.204842	Durbin-Watson stat	1.927098
Prob(F-statistic)	0.001352		

Tab. 4b - *Change in German unemployment as a function of its own history, the change in real exports, and the change in fiscal policy(TSLS)*

TSLS // Dependent Variable is DWDUE
Sample(adjusted): 1963 1994
Included observations: 32 after adjusting endpoints
Instrument list: C DWDUE(-1) DWDUE(-2) DWDEXPECU(-1) D(WDGOVDEF(-1)) D(WDGOVDEFC) D(IMPEU)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.154993	0.282352	0.548935	0.5879
DWDUE(-1)	0.914581	0.213573	4.282290	0.0002
DWDUE(-2)	-0.595783	0.229778	-2.592858	0.0157
DWDEXPECU	-0.057101	0.035061	-1.628632	0.1159
DWDEXPECU(-1)	0.056125	0.029467	1.904687	**0.0684**
D(WDGOVDEF)	0.155552	0.121176	1.283681	**0.2110**
D(WDGOVDEF(-1))	0.079663	0.086567	0.920253	0.3662

R-squared	0.462950	Mean dependent var	0.194184
Adjusted R-squared	0.334058	S.D. dependent var	0.681623
S.E. of regression	0.556240	Akaike info criterion	-0.982469
Sum squared resid	7.735085	Schwarz criterion	-0.661840
F-statistic	4.334800	Durbin-Watson stat	2.054864
Prob(F-statistic)	0.003942		

Tab. 4c - *Change in German unemployment as a function of its own history, the change in real exports, and the change in monetary policy (TSLS)*

TSLS // Dependent Variable is DWDUE
Sample(adjusted): 1963 1994
Included observations: 32 after adjusting endpoints
Instrument list: C DWDUE(-1) DWDUE(-2) DWDEXPECU(-1)
SPREADWD(-1) D(WDGOVDEF) D(IMPEU) D(USINTS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.384724	0.233207	1.649708	0.1115
DWDUE(-1)	0.625819	0.190317	3.288291	0.0030
DWDUE(-2)	-0.097999	0.166769	-0.587634	0.5620
DWDEXPECU	-0.034797	0.025546	-1.362103	**0.1853**
DWDEXPECU(-1)	0.024122	0.020369	1.184236	0.2475
SPREADWD	-0.028964	0.097831	-0.296058	0.7696
SPREADWD(-1)	-0.184280	0.076665	-2.403693	**0.0240**

R-squared	0.696809	Mean dependent var	0.194184
Adjusted R-squared	0.624044	S.D. dependent var	0.681623
S.E. of regression	0.417939	Akaike info criterion	-1.554199
Sum squared resid	4.366827	Schwarz criterion	-1.233569
F-statistic	9.040921	Durbin-Watson stat	1.932187

Tab. 4d - *Change in German unemployment as a function of its own history, the change in real exports, and the change in all shock absorbers (TSLS)*

TSLS // Dependent Variable is DWDUE
Sample(adjusted): 1963 1994
Included observations: 32 after adjusting endpoints
Instrument list: C DWDUE(-1) DWDUE(-2) DWDEXPECU(-1)
DDEREER(-1) D(WDGOVDEF(-1)) SPREADWD(-1) EMS D(IMPEU)
D(USINTS) D(WDGOVDEFC)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.569848	0.245416	2.321962	0.0283
DWDUE(-1)	0.948452	0.225555	4.204977	0.0003
DWDEXPECU	-0.037448	0.031871	-1.175009	**0.2506**
DDEREER	0.019096	0.037367	0.511031	0.6136
D(WDGOVDEF)	-0.149834	0.098806	-1.516449	0.1415
SPREADWD	-0.337551	0.096531	-3.496833	**0.0017**

R-squared	0.465899	Mean dependent var	0.194184
Adjusted R-squared	0.363187	S.D. dependent var	0.681623
S.E. of regression	0.543939	Akaike info criterion	-1.050475
Sum squared resid	7.692614	Schwarz criterion	-0.775650
F-statistic	6.255275	Durbin-Watson stat	2.143991
Prob(F-statistic)	0.000619		

Tab. 5a - *Change in German manufacturing employment as a function of its own history, the change in real exports, and the change in real effective exchange rates (TSLS)*

TSLS // Dependent Variable is D(EMPLMANWD)
Sample(adjusted): 1963 1994
Included observations: 32 after adjusting endpoints
Instrument list: C D(EMPLMANWD(-1)) D(EMPLMANWD(-2)) DWDEXPECU(-1) DDEREER(-1) EMS D(IMPEU) D(USINTS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.850998	1.310993	-0.649125	0.5222
D(EMPLMANWD(-1))	0.918393	0.422922	2.171544	0.0396
D(EMPLMANWD(-2))	-0.579406	0.283849	-2.041246	0.0519
DWDEXPECU	0.197383	0.143995	1.370761	0.1826
DWDEXPECU(-1)	-0.100891	0.127833	-0.789243	0.4374
DDEREER	-0.243914	0.614459	-0.396958	0.6948
DDEREER(-1)	-0.058501	0.140920	-0.415137	0.6816

R-squared	0.220425	Mean dependent var	-0.701426
Adjusted R-squared	0.033328	S.D. dependent var	2.640198
S.E. of regression	2.595829	Akaike info criterion	2.098452
Sum squared resid	168.4582	Schwarz criterion	2.419082
F-statistic	3.005442	Durbin-Watson stat	1.909820
Prob(F-statistic)	0.023720		

Tab. 5b - *Change in German manufacturing employment as a function of its own history, the change in real exports, and the change in fiscal policy (TSLS)*

TSLS // Dependent Variable is D(EMPLMANWD)
Sample(adjusted): 1963 1994
Included observations: 32 after adjusting endpoints
Instrument list: C D(EMPLMANWD(-1)) D(EMPLMANWD(-2)) DWDEXPECU(-1) D(WDGOVDEF(-1)) D(IMPEU) D(WDGOVDEFC)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.395831	1.049449	-1.330061	0.1955
D(EMPLMANWD(-1))	0.741224	0.209581	3.536700	0.0016
D(EMPLMANWD(-2))	-0.656548	0.235851	-2.783746	0.0101
DWDEXPECU	0.267895	0.134706	1.988735	**0.0578**
DWDEXPECU(-1)	-0.127802	0.115580	-1.105747	0.2794
D(WDGOVDEF)	-0.404327	0.474146	-0.852749	0.4019
D(WDGOVDEF(-1))	-0.164562	0.359862	-0.457293	0.6514

R-squared	0.476974	Mean dependent var	-0.701426
Adjusted R-squared	0.351448	S.D. dependent var	2.640198
S.E. of regression	2.126223	Akaike info criterion	1.699334
Sum squared resid	113.0206	Schwarz criterion	2.019964
F-statistic	4.272476	Durbin-Watson stat	1.867949
Prob(F-statistic)	0.004269		

Tab. 5c - *Change in German manufacturing employment as a function of its own history, the change in real exports, and the change in monetary policy (TSLS)*

TSLS // Dependent Variable is D(EMPLMANWD)
Sample(adjusted): 1963 1994
Included observations: 32 after adjusting endpoints
Instrument list: C D(EMPLMANWD(-1)) D(EMPLMANWD(-2)) DWDEXPECU(-1) SPREADWD(-1) D(WDGOVDEF) D(IMPEU) D(USINTS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.895826	0.872212	-2.173583	0.0394
D(EMPLMANWD(-1))	0.643553	0.158885	4.050430	0.0004
D(EMPLMANWD(-2))	-0.358624	0.141847	-2.528249	0.0182
DWDEXPECU	0.195071	0.100583	1.939404	**0.0638**
DWDEXPECU(-1)	-0.037806	0.077361	-0.488699	0.6293
SPREADWD	-0.232137	0.330427	-0.702536	0.4888
SPREADWD(-1)	0.729043	0.244198	2.985454	**0.0063**

R-squared	0.708627	Mean dependent var	-0.701426
Adjusted R-squared	0.638697	S.D. dependent var	2.640198
S.E. of regression	1.586982	Akaike info criterion	1.114309
Sum squared resid	62.96283	Schwarz criterion	1.434938
F-statistic	9.538972	Durbin-Watson stat	1.847064
Prob(F-statistic)	0.000017		

Tab. 5d - Change in German Manufacturing employment as a function of its own history, the change in real exports, and the change in all shock absorbers (TSLS)

TSLS // Dependent Variable is D(EMPLMANWD)
Sample(adjusted): 1963 1994
Included observations: 32 after adjusting endpoints
Instrument list: C D(EMPLMANWD(-1)) D(EMPLMANWD(-2)) DWDEXPECU(-1) DDEREER(-1) D(WDGOVDEF(-1)) SPREADWD(-1) D(WDGOVDEFC) D(IMPEU)EMS D(USINTS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.344141	0.697381	-3.361350	0.0025
D(EMPLMANWD(-1))	0.672837	0.139118	4.836451	0.0001
D(EMPLMANWD(-2))	-0.359497	0.150123	-2.394688	0.0245
DWDEXPECU	0.206699	0.095040	2.174858	**0.0393**
DDEREER(-1)	-0.050774	0.067070	-0.757029	0.4561
D(WDGOVDEF)	-0.169493	0.333393	-0.508390	0.6156
SPREADWD(-1)	0.673775	0.228095	2.953916	**0.0067**

R-squared	0.666881	Mean dependent var	-0.701426
Adjusted R-squared	0.586932	S.D. dependent var	2.640198
S.E. of regression	1.696864	Akaike info criterion	1.248203
Sum squared resid	71.98367	Schwarz criterion	1.568833
F-statistic	8.425235	Durbin-Watson stat	1.660067
Prob(F-statistic)	0.000047		

Experimenting with other instruments for the government deficit, as e.g. government receipts excluding social security contributions, led to similar results but to a shorter sample period. For this

reason, they are not tabulated here. Strikingly, different export definitions gave rise to the *same* kind of results.

V. Interpretation

The results so far suggest that it is difficult to identify the size of the impact of the *standard shocks* considered in the OCA literature (i.e. shocks to exports) on the evolution of unemployment in Europe and that fixing exchange rates is ceteris paribus not likely to make a difference in this respect. But could one not argue that there might be *other* types of shocks, which are empirically more important for unemployment and that could be better managed with flexible exchange rates? Shocks to investment constitute an obvious candidate given the high variability of this component of aggregate demand[13] and it is widely assumed that they constitute a major determinant of the business cycle. We therefore applied our simple methodology to this case to find out whether investment is an important determinant of unemployment. The results are interesting because they are so different from the ones for export shocks.

Table 6 below shows the results of the same simple regressions as above: the growth rate of investment (gross fixed capital formation in constant prices) is used an explanatory variable besides significant past values of the (change in the) unemployment rate. The contrast with table 1a, which contains the results for export shocks, is clear: we find that for all the 11 countries considered here the growth of investment has an influence on unemployment that is in most cases significant at the 1 % level. (Since investment is notoriously difficult to forecast, the actual growth rates of investment are equivalent to shocks.) Our own findings thus confirm that investment is an important determinant of the business cycle.

13 Once in a life-time major asymmetric demand shocks, such as German unification, might also require an exchange rate adjustment. For a critical view of this position see the empirical study on the 92/93 EMS crisis by Belke 1996. However, we want to restrict our analysis to 'normal' shocks, i.e. shocks whose distribution can be estimated on the basis of past data.

Table 6a - *Summary results for unemployment changes as a function of the change in investment*

	Annual change in unemployment	Annual change in employment manufacturing
BE	(0) -0.069***	(0) 0.445***
DK	(0) -0.044***	(0) 0.191***
ES	(0) -0.116*** (-1) 0.056*	(0) 0.350***
FR	(0) -0.070***	(0) 0.238***
GR	n.a.	n.a.
IR	(0) -0.043***	(0) 0.153*** (-1) 0.110**
IT	(0) -0.057***	(0) 0.205***
NL	(0) -0.072***	(0) 0.176***
PO	(0) -0.020**	(0) 0.121**
UK	(0) -0.0791***	(0) 0.238**
WD	(0) -0.076***	(0) 0.278***

Note: Data source: European Commission. The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. Additional country-specific dummies were included when necessary. Lag order of changes in investment in brackets. n.a.: not available.

Does the result that shocks to investment demand seem to have a clearly identifiable impact on unemployment mean that the exchange rate might be useful after all to allow the national central bank to offset them through the appropriate interest rate and/or exchange rate reaction. In other words, could EMU be costly because it does not allow countries to react with a national monetary policy to idiosyncratic shocks to (domestic) investment? We would argue that this conclusion is not warranted for two reasons, one theoretical and one empirical. To start with the latter: We found above that the exchange rate is apparently not a potent factor in the determination of unemployment, at least if considered alongside export shocks. Moreover and more important, the inclusion of exchange rates and interest rates does not affect the result that export demand shocks are not an important and easy to estimate determinant of unemployment. For the case of investment shocks we find the same result. Besides the fact that exchange rates do not seem to be a significant determinant of unemployment, the inclusion of these monetary policy instruments does not apear to affect the result that investment is an important determinant of unemployment. The evidence even appears to be more pronounced than with respect to exports. The tables 7a and 7b reveal that for the overwhelming majority of countries the significance of investment remains on the same high level as without the implementation of real effective exchange rates. In three cases it even increases, in only one marginal case -namely Denmark- it shrinks from one to five percent. However, one might argue that at least the regressions containing both changes in investment and the interest spread suffer from a simultaneous equation bias. For this reason, the OLS-results are not presented here. However, the respective TSLS regressions are available on request.

Table 7a - *Change in unemployment as a unction of its own history, the change in investment and the change in real effective exchange rates (OLS)*

Country	Change in unemployment (lags)	Change in investment (lags)	Change in real effective exchange rates (lags)
BE	(-1)***	(0) -0.07*** (→)	(0) -0.004
DK	(-1)**	(0) -0.04** (↓)	(0) -0.009
ES	(-1)*** (-2)*	(0) -0.11*** (→)	(0) -0.023
FR	(-1)	(0) -0.07*** (→)	(0) 0.012
GR		n.a.	
IR	(-1)***	(0) -0.04*** (→)	(-1) 0.038
IT	(-1)**	(0) -0.05*** (→)	(0) -0.020
NL	(-1)***	(0) -0.07*** (→)	(-1) -0.020
PO	(-1)***	(0) -0.02*** (↑)	(-2) 0.019**
UK	(-1)***	(0) -0.10*** (→)	(-1) 0.054***
WD	(-1)*** (-2)***	(0) -0.08*** (→)	(-2) -0.03**

Note: The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. ↑ (↓) means that the coefficient becomes more (less) significant than in the respective equation without the real effective exchange rate. Additional country-specific dummies were included when necessary. n.a.: not available.

Table 7b - *Change in employment in manufacturing as a function of its own history, the change in investment and the change in real effective exchange rates (OLS)*

Country	Change in Employment (Lags)	Change in Investment (Lags)	Change in Real Effective Exchange Rates (Lags)
BE	(-1)***	(0) 0.21*** (→)	(-1) -0.105*
DK	(-1)*	(0) 0.20*** (→)	(-1) -0.07
ES		(0) 0.24*** (→)	(0) 0.21**
FR	(-1)***	(0) 0.2*** (→)	(0) -0.05
GR		n.a.	
IR	(-1)	(0) 0.13*** (-1) 0.12*** (↑)	(-1) -0.14*
IT	(-1)***	(0) 0.20*** (→)	(-1) -0.10**
NL	(-1)***	(0) 0.19*** (→)	(0) -0.07
PO	(-1)**	(0) 0.16*** (↑)	(-1) -0.16***
UK	(-1)***	(0) 0.20** (→)	(-1) -0.16*
WD	(-1)*** (-2)***	(0) 0.27*** (→)	(-1) -0.08*

Note: The table summarises results from regressions on annual data (1960-1996); */**/*** indicates significance at α=0.1/0.05/0.01. ↑ (↓) means that the coefficient becomes more (less) significant than in the respective equation without the real effective exchange rate. Additional country-specific dummies were included when necessary.

But there is also a second, more fundamental argument: in considering the use of the exchange rate for demand management purposes one has to keep in mind that an exchange rate change shifts demand from one country to another and thus always, at least partially, has a "beggar-thy-

neighbour" effect. In order to decide whether it is in the interest of "Europe" to use (intra-European) exchange rates to offset domestic demand shocks, one has to take this aspect into account. The real issue is thus the optimal exchange rate policy from the point of view of the welfare *of the system*. This issue cannot be addressed with the usual one-country models (which prescribe an exchange rate adjustment in response to any internal shock - demand, supply or other). One has to use a *two-country* model.

For example, Gros and Lane (1994) use a standard two-country model with short-term wage rigidity to analyze optimal exchange rate policy in the presence of supply and demand shocks. They find that the Pareto optimum (which happens to coincide with the Nash equilibrium) is to let the exchange rate move in response to both shocks; but only if there are foreign shocks. This result implies that if two countries have a similar structure, so that shocks to the relative price of the goods they produce are unlikely, asymmetric shocks to domestic demand or supply are not a reason to keep exchange rates flexible. Different models might lead to slightly different results, but the basic intuition is likely to be robust to changes in the particular model used. From the point of view of the system, there is no need to use exchange rates to distribute the impact of local shocks to demand if countries produce and consume the same goods.

This argument that the effects of exchange rate changes on demand net out to zero at the global level does not apply to shocks that affect trade directly. If demand shifts from one country to another, an exchange rate adjustment is required from the point of view of both. Hence, fluctuations in exports are the main source of shocks that should be taken into account to ascertain the importance of exchange rate flexibility from a global point of view. Other legitimate sources of shocks would be external shocks (like an oil price change) that have differential effects because of differences in the importance of energy.

By contrast, one could imagine the case of a country which experiences a sudden fall in domestic demand because the 'animal spirits' that drive investment turn sour or because households suddenly save more. A depreciation would shift demand towards domestic goods and increase exports, thus reducing the unemployment that would otherwise result from the drop in demand. The "gain" in demand of the country experiencing the shock, however, would come at the expense of the rest of the world. The country that depreciates would only export its unemployment problems. From a global point of view, little would be gained from exchange rate flexibility in this case.

But where do macroeconomic shocks come from? It is likely *that policy itself* is a source of shocks. Policy shocks, e.g. changes in fiscal or other economic policies, affect overall demand and thus also the exchange rate _ as could be observed in the case of the US dollar during the 1980s. Nevertheless, policy shocks are not unavoidable and, as argued above, it is not always clear that in this case an exchange rate adjustment is a desirable consequence from a global point of view.

It is difficult to imagine in concrete terms economy-wide shocks that are driven by sudden changes in technology or tastes. While there might be sudden changes at the sectoral level, experience indicates that these fundamental determinants of the economy tend to change slowly at the aggregate level, which should give prices and wages enough time to adjust to maintain

equilibrium. For example, the rise in the importance of the automobile industry or the decline of railways took decades. These secular changes certainly caused severe adjustment problems, but the argument that adjustments in the real exchange rate can be achieved more quickly through changes in the nominal exchange rate loses its significance for trends that work over a decade or more (Gros 1996).

VI. Conclusions

The main motive behind the empirical work undertaken here was to identify the magnitude of the impact of external shocks on unemployment. This would have been a first step towards an estimate of the cost EMU. However, we did not succeed.

The main finding of this paper is a *negative* one, i.e. that we have not been able to detect a robust and statistically significant link between unemployment and external shocks. Different countries show different results, which at times are affected by minor changes in the definition of external shocks (e.g. growth of real exports versus the contribution of exports to overall demand growth). Taking into account possible shock absorbers like exchange rate movements, fiscal policy and monetary policy did not affect this result. A *slightly different* picture emerges *for employment in manufacturing*. There is a much stronger link between this variable and export shocks, if measured by the magnitude of coefficients and significance level. This finding is, however, qualified by TSLS estimations for Western Germany which a reveal rather small influences of export demand shocks even on employment in manufacturing.

Given that most trade is in manufactured products it is not surprising that the relationship between exports and manufacturing employment is much stronger than that with economy-wide unemployment. However, even in this case the results are *not sufficient* to make any tentative estimate of the cost of EMU for this sector of the economy because the sign of the correlation coefficients was often the opposite of what one have expected on theoretical grounds.

A key for the interpretation of this negative result is the contrast with our findings concerning the link between (un)employment and investment. Here we found a statistically significant relationship that is robust and consistent across countries. This difference in the results suggest immediately that hysteresis (Carlin and Soskice 1990) cannot be the reason of the absence of a correlation between export shocks and (un)employment. If rigidities prevent adjustments until shocks become very large, and if any adjustments that do take place are irreversible this should have the same effect on the estimates concerning investment. But this is apparently not the case.

We believe that the negative finding of this paper concerning export shocks is important given the way in which the optimum currency area approach has been used in the literature and the public debate on EMU. The main argument against EMU has always been that it does not allow countries to adjust to *external* shocks via the exchange rate. We show that the data from the past 30 years in Europe does not show any strong link between *external* shocks and unemployment. Hence we would argue that EMU is unlikely to lead to the serious unemployment problems that have often been predicted.

However, we would see four possible caveats remaining.

First, export shocks might only be estimated to be minor or to be insignificant in annual regressions because they are *instantaneously* (i.e. in a period shorter than one year) *neutralised* by adjustment in the labour market. But estimations by Gros (1996) with quarterly data gave an even stronger result: in almost no case can one detect an impact of external shocks on unemployment.

A second counter-argument against our results is that large shocks might have been *rare events* in our sample. That is, *variability* in the historical export shock series would be *too low* to identify a statistically significant impact on (un-) employment though it is in fact there. If this was the case, EU countries need exchange rate movements *from time to time* to cope for large infrequent asymmetric shocks and thus bear additional costs of higher unemployment in EMU. However, this argument is by its nature impossible to falsify or confirm empirically with the available data. We therefore did not pursue this argument any further.

Third, the low frequency of our data lead to a low number of degrees of freedom in our estimations. That means, besides estimations with quarterly data one direction of future research should be based on pooling of EU-country data. Another possible improvent might lie in the use of SURE regressions. The seemingly unrelated regression method originally applies to a system where each equation has an endogenous variable on the left side and only exogenous variables on the right side. As in the standard regression case, the disturbances are assumed to be uncorrelated with the exogenous variables. Each equation of this kind of a system could be estimated by regression, equation by equation, as in Tab. 1 and 2. However, the disturbance in a regression equation for *one* country could be *correlated* with the residual of an equation for some *other* country, i.e. in the case of symmetric shocks to real variables. In this case, the SUR estimator might be more efficient, because it explicitly takes account of the entire matrix of correlations of all of the equations. Moreover, the presence of lagged dependent variables creates no problem (though the SURE method assumes nonstochastic regressors), if the residuals in each equation satisfy the classical assumptions.

Fourth, according to the Lucas-critique one should not extrapolate empirical results concerning export shocks to EMU (Lucas 1976; Viñals and Jimeno 1997). We would argue, however, that EMU will not affect the industrial structure of Europe in the short run. There is little reason to believe that the variability of idiosyncratic shocks to exports will change substantially over the next 5 - 10 years. Hence, we would argue that our results concerning the absence of a strong link between export shocks and unemployment tax relevant for EMU.

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Variable List

DEXPECU	annual percentage change of EXPECU
DEXPECUAV	change in European avg. of constant ECU exports (EU15=Ameco E5 (1960-74), E8 (1975-90), E9 (1991-95))
DEXPECUDIFF	change in difference with European avg. of constant ECU exports (DEXPECU - DEXPECUAV)
EMPLMAN	employment in manufacturing (index)
EMPLMANEU	EU-average employment in manufacturing (index), EU = BE+DK+FR+IR+IT+NL+UK+WD (for limitations of data for other EU-countries)
EU15UE	EU average unemployment rate (EU15=Ameco E5 (1960-74), E8 (1975-90), E9 (1991-95))
EXPECU	exports of goods and services at 1990 prices (billion ECU)
EXPGDP	total exports of goods (% of GDP)
EXPGDPDIFF	total exports of goods (% of GDP), difference with European average (E5EXPGDP)
EXPGDPEU	intra-EU15 exports of goods (% of GDP)
EXPCONTR	contribution of exports of goods and services to GDP growth at constant market prices (% GDP of preceding year).
EXPCONTRDIFF	contribution of exports of goods and services to GDP growth at constant market prices (% GDP of preceding year), difference with European average (E8EXPCONTR)
E5EXPGDP	total exports of goods (% of GDP) EU-average AMECO E5
E8EDXPCONTR	contribution of exports of goods and services to GDP growth at constant market prices (% GDP of preceding year), AMECO E8
GOVDEF	net lending (+) or net borrowing (-) of general government (%of GDP at market prices)
GOVDEFC	general government structural balance (surplus (+), deficit (-))
INTL	nominal long-term interest rate
INTS	nominal short-term interest rate
INV	investment (gross fixed capital formation in constant prices)
REER	real effective exchange rates relative to 19 industrial countries (1991=100, double export weights, unit labor costs)), increasing index means appreciation of the respective currency
RESEXPECUF	shock component of EXPECU
RESEXPGDPEUF	shock component of EXPGDPEU
SPREAD	national interest rate spread INTL-INTS
UE	unemployment rate

Data Sources: AMECO (European Commission), IFS (IMF), Own Calculations.

Annex 1a: Estimated Export Demand Equations (DEXPECU)

LS // Dependent Variable is DBEEXPECU
Sample(adjusted): 1963 1996
Included observations: 34 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.462347	0.796349	4.347775	0.0002
DBEEXPECU(-2)	0.491160	0.119305	4.116831	0.0003
D83	-5.358391	2.296791	-2.332990	0.0271
D85	-5.267907	2.286050	-2.304371	0.0288
DGDPEU15	2.320083	0.255866	9.067571	0.0000
DGDPEU15(-1)	1.917525	0.305927	6.267914	0.0000

R-squared	0.777652	Mean dependent var	5.666973
Adjusted R-squared	0.737947	S.D. dependent var	4.355876
S.E. of regression	2.229822	Akaike info criterion	1.762629
Sum squared resid	139.2190	Schwarz criterion	2.031987
Log likelihood	-72.20860	F-statistic	19.58572
Durbin-Watson stat	1.835570	Prob(F-statistic)	0.000000

LS // Dependent Variable is DDKEXPECU
Sample(adjusted): 1962 1996
Included observations: 35 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.287208	0.399794	13.22482	0.0000
D75	-6.800426	2.387389	-2.848478	0.0079
D86	-5.386862	2.298731	-2.343406	0.0259
D93	-6.423151	2.328801	-2.758137	0.0098
DGDPEU15	0.249134	0.242050	1.029268	0.3116

R-squared	0.448424	Mean dependent var	4.726297
Adjusted R-squared	0.374881	S.D. dependent var	2.860403
S.E. of regression	2.261562	Akaike info criterion	1.763675
Sum squared resid	153.4399	Schwarz criterion	1.985868
Log likelihood	-75.52716	F-statistic	6.097412
Durbin-Watson stat	1.954357	Prob(F-statistic)	0.001028

LS // Dependent Variable is DESEXPECU
Sample(adjusted): 1963 1996
Included observations: 34 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.150268	1.480656	4.153746	0.0002
D67	-12.22870	5.031096	-2.430625	0.0213
DESEXPECU(-2)	0.269483	0.151071	1.783824	0.0846
DGDPEU15	1.292830	0.514233	2.514095	0.0175

R-squared	0.332596	Mean dependent var	7.823238
Adjusted R-squared	0.265856	S.D. dependent var	5.773077
S.E. of regression	4.946500	Akaike info criterion	3.307491
Sum squared resid	734.0357	Schwarz criterion	3.487063
Log likelihood	-100.4713	F-statistic	4.983438
Durbin-Watson stat	1.335085	Prob(F-statistic)	0.006353

LS // Dependent Variable is DFREXPECU
Sample(adjusted): 1963 1996
Included observations: 34 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.375688	0.894646	2.655450	0.0131
D82	-5.763211	2.464723	-2.338280	0.0270
D8586	-6.576324	1.721604	-3.819882	0.0007
DFREXPECU(-1)	0.406581	0.133354	3.048891	0.0051
DFREXPECU(-2)	0.333685	0.142255	2.345672	0.0266
DGDPEU15	1.346086	0.272728	4.935646	0.0000
DGDPEU15(-1)	1.279472	0.316658	4.040546	0.0004

R-squared	0.737207	Mean dependent var	6.013484
Adjusted R-squared	0.678809	S.D. dependent var	4.115118
S.E. of regression	2.332190	Akaike info criterion	1.874857
Sum squared resid	146.8560	Schwarz criterion	2.189107
Log likelihood	-73.11647	F-statistic	12.62377
Durbin-Watson stat	1.953002	Prob(F-statistic)	0.000001

LS // Dependent Variable is DGREXPECU
Sample(adjusted): 1964 1996
Included observations: 33 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.718244	1.204805	8.066237	0.0000
D68	-12.10948	6.697531	-1.808052	0.0818
D8182	-15.31405	4.749746	-3.224184	0.0033
D90	-14.07035	6.627065	-2.123165	0.0431
DGDPEU15	1.628918	0.737064	2.210009	0.0358
DGDPEU15(-2)	1.352038	0.732939	1.844681	0.0761

R-squared	0.459742	Mean dependent var	7.729893
Adjusted R-squared	0.359694	S.D. dependent var	8.063044
S.E. of regression	6.451975	Akaike info criterion	3.891738
Sum squared resid	1123.955	Schwarz criterion	4.163830
Log likelihood	-105.0387	F-statistic	4.595227
Durbin-Watson stat	1.453019	Prob(F-statistic)	0.003671

LS // Dependent Variable is DIREXPECU
Sample(adjusted): 1962 1996
Included observations: 35 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.440148	1.405129	6.718348	0.0000
D70	8.763078	4.141057	2.116145	0.0427
D84	8.038856	4.090496	1.965252	0.0587
DIREXPECU(-1)	-0.194656	0.142307	-1.367855	0.1815
DGDPEU15	0.515777	0.415275	1.242013	0.2239

R-squared	0.291581	Mean dependent var	8.199894
Adjusted R-squared	0.197125	S.D. dependent var	4.482366
S.E. of regression	4.016348	Akaike info criterion	2.912310
Sum squared resid	483.9315	Schwarz criterion	3.134502
Log likelihood	-95.62826	F-statistic	3.086953
Durbin-Watson stat	1.429497	Prob(F-statistic)	0.030523

LS // Dependent Variable is DITEXPECU
Sample(adjusted): 1962 1996
Included observations: 35 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.543889	0.889407	6.233241	0.0000
D65	11.36985	3.087951	3.682004	0.0009
D80	-15.16455	3.101066	-4.890109	0.0000
D82	-8.629248	3.040619	-2.837990	0.0082
DITEXPECU(-1)	0.222148	0.105261	2.110447	0.0436
DGDPEU15	0.565049	0.315032	1.793621	0.0833

R-squared	0.665318	Mean dependent var	6.662281
Adjusted R-squared	0.607614	S.D. dependent var	4.760733
S.E. of regression	2.982157	Akaike info criterion	2.340099
Sum squared resid	257.9046	Schwarz criterion	2.606730
Log likelihood	-84.61458	F-statistic	11.52988
Durbin-Watson stat	2.083981	Prob(F-statistic)	0.000003

LS // Dependent Variable is DNLEXPECU
Sample(adjusted): 1962 1996
Included observations: 35 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.494931	0.552152	4.518562	0.0001
D77	-7.817812	1.817200	-4.302120	0.0002
D82	-6.081719	1.805984	-3.367537	0.0022
D86	-4.807276	1.785048	-2.693079	0.0116
DNLEXPECU(-1)	0.689155	0.083765	8.227266	0.0000
DGDPEU15	1.778227	0.197374	9.009423	0.0000

R-squared	0.834740	Mean dependent var	5.569090
Adjusted R-squared	0.806247	S.D. dependent var	3.987884
S.E. of regression	1.755362	Akaike info criterion	1.280155
Sum squared resid	89.35753	Schwarz criterion	1.546786
Log likelihood	-66.06555	F-statistic	29.29626
Durbin-Watson stat	1.880263	Prob(F-statistic)	0.000000

LS // Dependent Variable is DPOEXPECU
Sample(adjusted): 1962 1996
Included observations: 35 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.823557	1.497370	2.553516	0.0160
D64	25.53377	7.123509	3.584437	0.0012
D79	19.47339	7.065944	2.755951	0.0099
DPOEXPECU(-1)	0.364967	0.127034	2.872985	0.0074
DGDPEU15	2.313802	0.756261	3.059529	0.0046

R-squared	0.561368	Mean dependent var	7.479500
Adjusted R-squared	0.502884	S.D. dependent var	9.826530
S.E. of regression	6.928340	Akaike info criterion	4.002804
Sum squared resid	1440.057	Schwarz criterion	4.224997
Log likelihood	-114.7119	F-statistic	9.598612

Durbin-Watson stat	1.522523	Prob(F-statistic)	0.000040

LS // Dependent Variable is DUKEXPECU
Sample(adjusted): 1963 1996
Included observations: 34 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.330405	0.648661	5.134278	0.0000
D68	5.962196	2.328347	2.560700	0.0164
D74	6.156590	2.509867	2.452955	0.0209
D88	-5.316704	2.304817	-2.306779	0.0290
DUKEXPECU(-2)	0.215841	0.128918	1.674254	0.1056
DGDPEU15	1.204986	0.261241	4.612540	0.0001
DGDPEU15(-1)	1.126061	0.263318	4.276436	0.0002

R-squared	0.649649	Mean dependent var	4.185796
Adjusted R-squared	0.571793	S.D. dependent var	3.420419
S.E. of regression	2.238237	Akaike info criterion	1.792618
Sum squared resid	135.2621	Schwarz criterion	2.106869
Log likelihood	-71.71842	F-statistic	8.344255
Durbin-Watson stat	2.393383	Prob(F-statistic)	0.000036

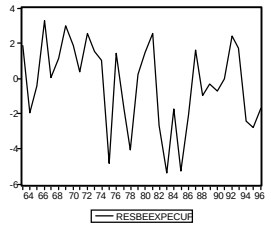
LS // Dependent Variable is DWDEXPECU
Sample(adjusted): 1962 1994
Included observations: 33 after adjusting endpoints

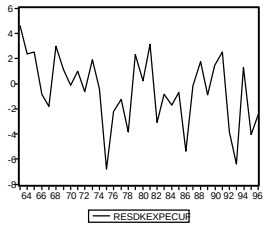
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.230151	0.993318	5.265332	0.0000
D75	-13.61327	2.966248	-4.589392	0.0001
D83	-7.736257	2.851115	-2.713415	0.0117
D86	-8.335845	2.863211	-2.911362	0.0073
D93	-7.798685	2.924823	-2.666378	0.0130
DWDEXPECU(-1)	0.308234	0.151359	2.036444	0.0520
DGDPEU15	0.625419	0.378513	1.652305	0.1105

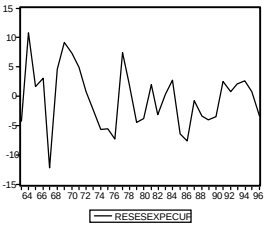
R-squared	0.648540	Mean dependent var	5.806537
Adjusted R-squared	0.567434	S.D. dependent var	4.245197
S.E. of regression	2.792057	Akaike info criterion	2.239388
Sum squared resid	202.6851	Schwarz criterion	2.556829
Log likelihood	-76.77488	F-statistic	7.996178
Durbin-Watson stat	1.835706	Prob(F-statistic)	0.000060

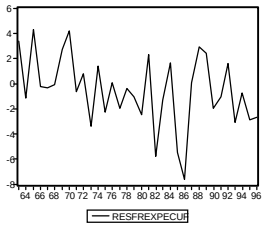
Annex 1b: Estimated Export Demand Shocks

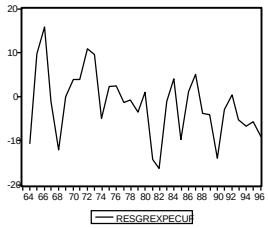
a) RESEXPECUF

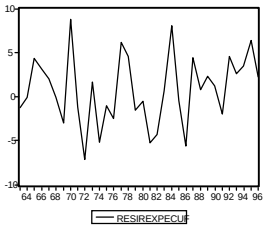


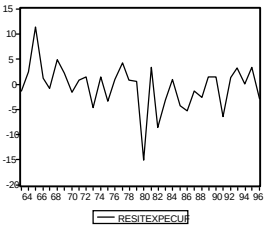


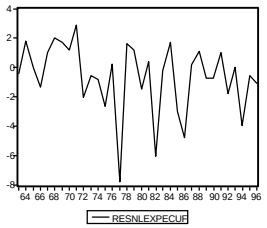


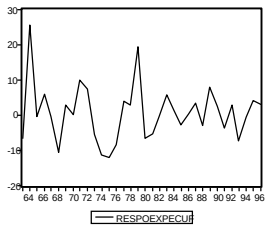


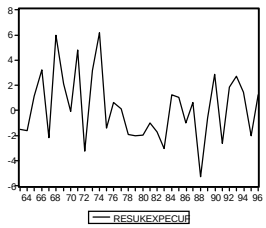


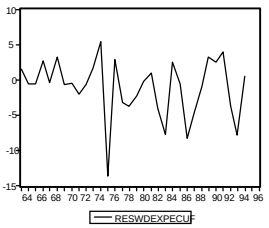












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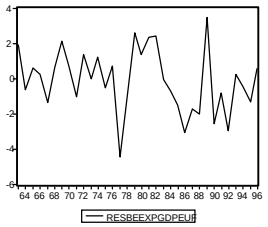

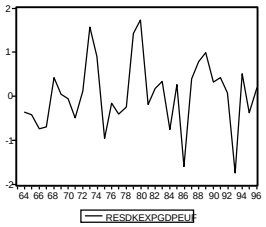

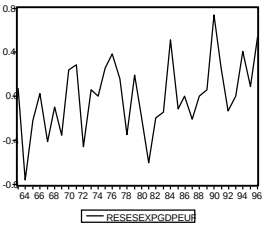

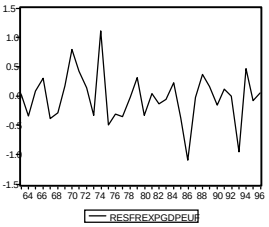

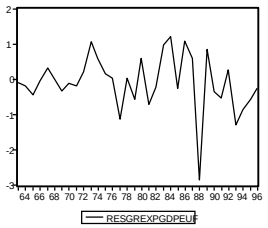

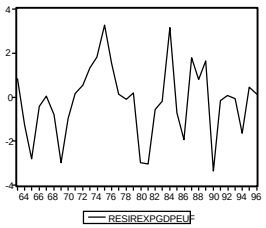

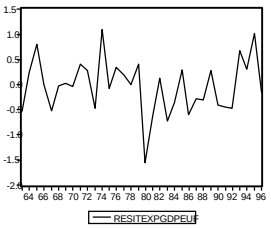

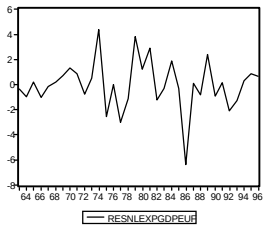

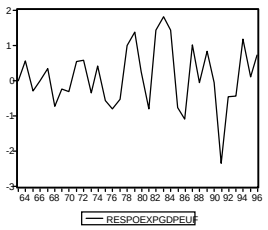

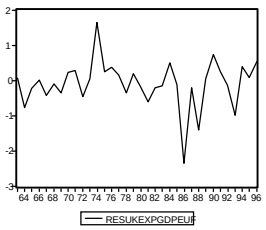

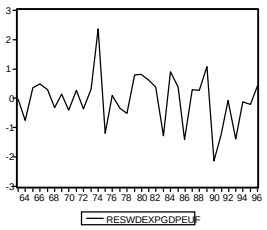

Annex 2: Descriptive Statistics for Time Series

-to be tabulated about here-

Annex 3: Selected Tests for Integration

Table A1: EXPECU

Series	*ADF(N)*	*ADF(C)*	*ADF(C,T)*	*PP(N)*	*PP(C)*	*PP(C,T)*
BEEXPECU	4.07	2.46	0.08	8.80	3.37	-0.03
DKEXPECU	3.99	2.16	-0.71	8.05	2.42	-1.27
ESEXPECU	3.47	2.66	1.15	9.02	4.82	2.21
FREXPECU	3.09	1.37	-1.74	6.44	2.24	-1.84
GREXPECU	2.69	1.13	-2.02	4.62	1.69	-1.92
IREXPECU	4.14	4.41	4.29	18.16	16.39	13.46
ITEXPECU	2.89	1.97	0.51	6.69	3.10	1.78
NLEXPECU	3.20	1.61	-0.70	6.62	2.12	-1.12
POEXPECU	3.24	1.98	-0.11	8.33	4.27	0.90
UKEXPECU	3.51	1.92	-0.44	7.09	2.42	-0.82
WDEXPECU	4.28	2.58	0.50	11.75	4.56	-0.12

ADF: empirical value of the ADF-test statistics (McKinnon, 1991); PP: empirical value of the Phillips-Perron (1988) test statistics; */**/***: stationarity indicated for α=0,10/0,05/0,01; N/C/C,T: neither constant nor trend/constante/constant and Trend in the test equation; sample: max. 1960-1996. Two lagged differences (ADF) resp. two 'truncation lags' (PP) proved to be sufficient to gain the desired properties of the residuals. /: cannot be calculated. n.a.: non available.

Table A2: DEXPECU

Series	*ADF(N)*	*ADF(C)*	*ADF(C,T)*	*PP(N)*	*PP(C)*	*PP(C,T)*
DBEEXPECU	-1.92*	-4.13***	-4.80***	-2.57**	-5.23***	-5.71***
DDKEXPECU	-1.45	-3.97***	-4.85***	-2.04**	-5.40***	-6.02***
DESEXPECU	-1.33	-3.61**	-4.37***	-2.11**	-5.38***	-5.85***
DFREXPECU	-1.30	-2.85*	-3.78**	-1.36	-3.43**	-3.79**
DGREXPECU	-1.64*	-3.07**	-3.82**	-3.77***	-5.40***	-5.82***
DIREXPECU	-0.46	-3.68***	-3.80**	-3.02***	-8.35***	-9.23***
DITEXPECU	-1.63	-3.22**	-3.42*	-2.42**	-4.81***	-5.00***
DNLEXPECU	-1.42	-2.91*	-3.46*	-1.85*	-4.27***	-4.57***
DPOEXPECU	-2.37**	-3.92***	-4.01**	-3.31***	-4.50***	-4.55***
DUKEXPECU	-1.65*	-4.12***	-4.11**	-3.25***	-5.72***	-5.64***
DWDEXPECU	-1.15	-3.23**	-3.49**	-2.32**	-5.38***	-5.61***

Notes: see table A1.

Table A3: UE

Series	*ADF(N)*	*ADF(C)*	*ADF(C,T)*	*PP(N)*	*PP(C)*	*PP(C,T)*
BEUE	0.41	-0.98	-2.02	0.27	-0.88	-2.21
DKEUE	-0.16	-1.27	-2.21	-0.23	-1.25	-1.96
ESUE	0.96	-0.47	-1.99	0.92	-0.40	-2.20
FRUE	1.42	-0.20	-2.52	2.03	-2.02	-2.36
GRUE	0.42	-0.91	-1.54	0.05	-0.97	-1.69
IRUE	0.45	-1.10	-1.82	0.57	-0.92	-1.87
ITUE	2.24	0.41	-3.05	3.35	1.73	-3.20*
NLUE	0.08	-1.35	-1.45	0.17	-1.19	-1.47
POUE	-0.06	-1.63	-2.23	0.01	-1.57	-2.02
UKUE	0.35	-0.96	-1.69	0.25	-1.09	-1.56
WDUE	0.39	-0.86	-2.39	0.48	-0.67	-2.33

Notes: see table A1.

Table A4: DUE

Series	*ADF(N)*	*ADF(C)*	*ADF(C,T)*	*PP(N)*	*PP(C)*	*PP(C,T)*
DBEUE	-3.27***	-3.45**	-3.38*	-2.76***	-2.82*	-2.72
DDKEUE	-3.96***	-3.98***	-3.92**	-3.76***	-3.69***	-3.64**
DESUE	-3.15***	-3.69***	-3.59***	-2.58**	-2.71*	-2.62
DFRUE	-2.71***	-3.53**	-3.48*	-3.75***	-4.28***	-4.19**
DGRUE	-3.26**	-3.33**	-3.31*	-2.21**	-2.18	-2.27
DIRUE	-3.62***	-3.75***	-3.70**	-3.18***	-3.17**	-3.10
DITUE	-4.39***	-5.14***	-5.24***	-3.699***	-20.54***	/
DNLUE	-3.89***	-4.01***	-4.02**	-4.41***	-4.48***	-4.46***
DPOUE	-3.17***	-3.21**	-3.16	-3.28***	-3.29**	-3.23*
DUKUE	-4.48***	-4.61***	-4.55***	-2.84***	-3.20**	-3.61**
DWDUE	-3.97***	-4.15***	-4.08**	-2.72***	-2.77*	-2.66

Notes: see table A1.

Table A5: EMPLMAN

Series	*ADF(N)*	*ADF(C)*	*ADF(C,T)*	*PP(N)*	*PP(C)*	*PP(C,T)*
EMPLMANBE	-1.80*	-0.39	-2.23	-1.58	-0.04	-2.64
EMPLMANDK	-1.05	-1.72	-1.84	-1.25	-1.91	-1.91
EMPLMANES	-0.54	-1.78	-2.23	-1.81	-2.22	-2.28
EMPLMANFR	-1.09	0.10	-1.74	-0.98	0.27	-1.54
EMPLMANGR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EMPLMANIR	1.26	-1.24	-1.91	1.57	-1.66	-2.11
EMPLMANIT	-0.50	-1.04	-1.25	-0.36	-1.20	-1.24
EMPLMANNL	-2.09**	-1.36	-1.67	-1.78	-0.55	-2.22
EMPLMANPO	-1.01	-2.00	-4.26**	-0.58	-1.21	-2.22
EMPLMANUK	-2.76***	-1.31	-1.55	-3.32***	-1.01	-1.75
EMPLMANWD	-1.42	-0.32	-2.42	-1.35	-0.03	-2.31

Notes: see table A1.

Table A6: REER

Series	*ADF(N)*	*ADF(C)*	*ADF(C,T)*	*PP(N)*	*PP(C)*	*PP(C,T)*
BEREER	-0.25	-2.68*	-2.86	-0.26	-2.34	-2.31
DEREER	-1.86	0.28	-1.83	0.47	-2.30	-2.27
DKREER	0.42	-2.35	-2.19	0.55	-2.34	-2.15
ESREER	0.24	-3.06**	-3.53*	0.30	-2.34	-2.44
FRREER	-1.09	-1.41	-2.40	-1.21	-1.30	-2.66
GRREER	-1.08	-2.24	-1.39	-1.79*	-2.86*	-1.62
IRREER	-0.71	-1.42	-2.31	-0.79	-1.44	-2.08
ITREER	-0.24	-2.53	-2.48	-0.34	-2.04	-1.99
NLREER	0.29	-2.10	-2.00	0.41	-2.20	-1.87
POREER	-0.09	-1.54	-1.40	-0.25	-1.79	-1.59
UKREER	-0.71	-2.55	-2.48	-2.06	-2.04	-0.76

Notes: see table A1.

Table A7: GDPEU15

Series	*ADF(N)*	*ADF(C)*	*ADF(C,T)*	*PP(N)*	*PP(C)*	*PP(C,T)*
GDPEU15	-1.28	-1.88	-2.74	-1.69	-3.20**	-4.13**
DGDPEU15	-4.61***	-4.65***	-4.58***	-18.79***	-31.14***	-31.59***

Notes: see table A1.

Table A8: D(INV)

Series	*ADF(N)*	*ADF(C)*	*ADF(C,T)*	*PP(N)*	*PP(C)*	*PP(C,T)*
INVBE	-2.37**	-2.63	-2.57	-3.55***	-3.74***	-3.67**
INVDK	-3.09***	-3.02**	-2.94	-3.90***	-3.81***	-3.77**
INVES	-2.79***	-2.92*	-2.87	-2.54**	-2.59	-2.47
INVFR	-2.72***	-2.93*	-2.81	-2.86***	-2.94*	-2.83
INVGR	-4.27***	-4.33***	-4.16**	-4.60***	-4.52***	-4.60***
INVIR	-2.33**	-2.66*	-2.52	-3.40***	-3.62**	-3.49*
INVIT	-2.64**	-3.00**	-2.96	-3.10***	-3.30**	-3.18
INVNL	-2.49**	-2.78*	-2.86	-3.17***	-3.31**	-3.32*
INVPO	-3.30***	-3.88***	-3.75**	-3.00***	-3.07**	-3.00
INVUK	-2.53**	-2.87*	-2.82	-2.82***	-2.96*	-2.89
INVWD	-3.04***	-3.07**	-3.03	-2.94***	-2.87*	-2.84

The above tables have to be taken as selected examples. Results of the remaining integration tests are available from the authors on request.